

AVIATION WEEK

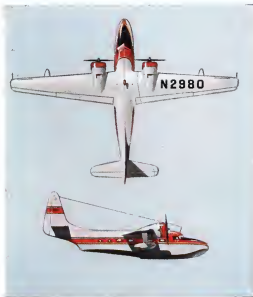
JUNE 14, 1954

50 CENTS

A MCGRAW-HILL PUBLICATION



WIDGEON



MALLARD

ALBATROSS



KNOWN FROM DJIBOUTI TO NARSARSSUAK

Like the five place Widgeon, the executive transport, the Mallard, is in service with companies and private owners throughout the world. The present production amphibian, the Grumman Albatross, is in global operations with the USAF Air Rescue Services, the Navy, and the Coast Guard. All told, Grumman has built more amphibians than any other company in the world.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE • LONG ISLAND • NEW YORK
DESIGNERS AND BUILDERS ALSO OF THE COUGAR JET FIGHTER, S2F-1 SUB-KILLER, METAL BOATS, AND AEROBILT TRUCK BODIES

**400 CPS $\pm 1/4\%$ regulation, long life,
lightweight compactness result from
material control like this...**



Metalograph permits microscopic examination of metal used in air equipment for Constant Speed Drive parts. Fluorescentographic provides permanent records.



Automatic balance weighs items in tenth thousandth part, under ± 0.01 mg. Used in quantitative analysis of materials.



High-frequency induction furnace permits independent capacity of 2200° Fahrenheit in heat-treating carbon and alloy steel of metals.



Spectrophotometer measures, with micro-chemical light, fluorescence of solution of metal to determine quantities of various elements present.



When in instrument control and record performance of 30-foot flying furnace
(Right) Control of suspended bath, with modern facilities to heat metal, rubber compounds, etc. in temperature range of -12° to $+325^{\circ}$ F.



Factories like these, devoted to material control and research, have contributed much to the development of the Sundstrand Constant Speed Drive. Lightweight, compact, long-life Sundstrand Drives regulate alternator frequency on 400 CPS, 450% power parallel operation—economically—with load division within ± 1 kw. work at rapid speed ratio of 3:1 or more. Call us for help on a-c power generation problems.

SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office, Houston, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

SEARCH KEYS

B.F. Goodrich

FIRST IN RUBBER



PROPELLER



STABILIZER



WING



ROTOR



AIR DOOR



ENGINE INTAKE



DIVISION CONE



OIL AND WATER LINES



HYDRAULIC ACTUATOR

How to keep planes from coming down with the cold

B. F. Goodrich electrically heated rubber supplies complete protection against ice and frost—even when the size and shape of the part may make it seem impossible. That's because B. F. Goodrich engineers can design heated rubber to fit snugly around the vulnerable curves and corners.

A lot of diverse resources were harnessed in the rubber supplies line two ways: (1) either to cycle to loose or to the airman can carry it away, or (2) continuously, so keep ice from forming in the first place.

Shown are some of the many B. F. Goodrich heated rubber applications:

Heated rubber keeps leading edges ice-free. On propellers, it prevents ice from reducing flying speed, on stabilizers, it assures safe control, on rudders, it eliminates chance of snapping; on tailbooms, it prevents serious control of flying. Boon for in-flight safety.

Heated rubber keeps ice from clogging vent air outlets. On air scoops, jet engine inlets and diffuser cones, it assures plentiful air supply.

Heated rubber keeps ports operating at top efficiency. On oil and water lines, hydraulic actuators, it provides constant operating temperatures.

B. F. Goodrich electrically heated

rubber can be made as thin as .040" for pressure locations, and .600" for external use. It simplifies design, saves weight, can be mounted right onto the part. It's another exclusive development of B. F. Goodrich engineering and research for aviation. Order B. F. Goodrich aviation products: tires, wheels, brakes, De Soto, Avco, Bendix, and, of course, B. F. Goodrich. Write: The B. F. Goodrich Co., Akron, Ohio.

B. F. Goodrich
FIRST IN RUBBER



FOREMOST IN SCIENTIFIC DEVELOPMENT

IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
FORGING DESIGNS WHICH AT THE
TIME OF THEIR DEVELOPMENT
WERE CONSIDERED IMPOSSIBLE
TO PRODUCE BY FORGING.

WYMAN-GORDON

Established 1875

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS

DETROIT, MICHIGAN

Domestic

Senate Appropriations Committee last week approved \$40 million for Civil Aeronautics Board airline subsidies. The sum is \$50 million less than asked by CAB and duplicates House action on the request. The committee and the full senate is adequate to meet already promised by Feb. 1, 1955. It directed the Board to "undertake a complete review of subsidy payments immediately" and report to the committee not later than January 1955.

Administration has asked Congress for \$22 million in request and for fiscal 1955. That is \$13 million less than the Commerce Department request in the Budget Bureau. Sen. Pat McCarran says the new request is "thoroughly inadequate to meet urgent requirements" and adds that he will fight for additional funds.

New turbine engine will be developed by Avco Manufacturing Corp.'s Licensing Division under an Air Force contract. The powerplant project, second undertaken by Licensing, Inc. USAF, will be conducted at the Stratford, Conn. plant under the direction of Dr. Arnold Franz, vice president-turbine engineering and designer of the world's first mass-produced aircraft turbojet.

Airplane winging model crashed at altitude of 90 mi. during test at White Sands Proving Ground, N. M., Airport General Corp. reports. The builder says it is conducting a program to extend the rack's altitude "consistently above" 130 mi.

Security charges last week forced suspension of three engineers at Republic Aviation Corp., Farmingdale, N. Y. The charges, made by the Eastern Industrial Personnel Security Board of USAF's Security Board, charge facts of legal Communist connections by psychometrics. Each suspension is for 60 days.

USAF Academy site probably will be selected by Secretary of the Air Force David E. Tallant within the next 30 days. A site commission, unable to agree on a location, recommended Alamogordo, Calif., Lake George, Wis., and Colorado Springs, Colo.

Navy's Avenger torpedo bomber will enter from first operational service this month, ending a 42 year interval that started with the Grumman TBF-1 and ended with General Motors' TBM-3.



How New Sikorsky Copter Hunts Subs

New Sikorsky HO4S-4 demonstrates its sub hunting technique by dipping a sonar detection device below the surface of the water during a recent post demonstration. Designed for Sikorsky (the full version the HO4S-4 version). The sons may be seen just above the water's surface, suspended from the copter. After coast and other surface water descent looks the sub, the copter launches lightweight hunting weapons. First deployment of the new Sikorsky set expected to be made in Navy operations only next year. The HO4S-4 is powered by a Licensing-built 1,575hp. Wright R2600 piston engine, uses a Sikorsky-developed propeller.

Navy still has 804 TBMs, plans to use them in advanced and rescue training and in attack roles.

A \$80,000 scholarship honoring Maj. Lester D. Gardner, retired leader of the Institute of the Aeronautical Sciences, has been set up by the Massachusetts Institute of Technology at Cambridge, Mass.

T-54 Menton have been ordered from South Aircraft Corp., Wichita, by El Salvador. The Central American country is scheduled to take delivery on the primary and tactical business in August.

Financial

Fairchild Engine & Airplane Corp., Fairport, N.Y., plans to release \$77,571 additional share of common stock on or about June 29, will offer the new issue to present holders on a one-for-four basis prior to the public sale.

Boji Aircraft Corp., Buffalo, N. Y., has declared a one-year dividend of \$1 on common stock, an increase of 25 cents over the similar payment of 1953. The dividend is payable Aug. 1 to common stockholders of record June 30.

Continental Air Lines will pay a dividend at 12 1/2 cents per share to stockholders of record June 16.

International

Second prototype Soviet S.E. 930 Bronco, France's lightweight tactical jet fighter, has made its first test flight. The S.E. 930A is powered by Saurat's Atre 181.

Gen. Umberto Sestini, 62, Italian fighter who learned to fly with Wright and helped found the Italian air force, died June 4 in Varese, Italy. At the time of his death, Sestini was general director of the Italian Aviation Co.

First commercial flight of Pakistan International Airways took off last week from Karachi to Dacca, carrying a capacity Super Constellation aircraft load of 90 passengers. Officials on the government-owned line took a \$15 loss on each line, estimate the operation will require \$1,118,000 subsidy annually.

French army air force has increased its order for Saurat's Nord 2501 Nicotides from 40 to 120. Saurat also reports "inter" commercial orders for the two-engine, high wing aircraft.

Mach 2 Power

- Plane engine revolution under way at Lewis Lab.
- NACA aim is sustained flight at 1,300 mph.

By Robert Hays

Cloudless-Kemistimay changes in propeller design and construction are under way aimed at pushing practical aircraft operating speeds up to Mach 2—1,300 mph at standard temperatures above 50,000 ft.

The propeller revolution now pushing meteoric speeds is one possible in scope and military importance to the radical changes in airplane design that have boosted the potential of airplane performance from subsonic speeds to more than Mach 2 during the past decade.

• **NACA Inspection**—Broad outlines of the propeller revolution were sketched by scientists of the National Advisory Committee for Aeronautics (NACA) during the three-day 1954 inspection of the Lewis Flight Propulsion Laboratory here.

"There is no sign that we are nearing the end of spectacular accomplishment in aeronautics," Eugene J. Maspero, assistant director of the Lewis Laboratory, told participants in the inspection.

"Never in the history of aeronautics have there been so many fruitful ideas to be explored by research, and never has there been a greater need for exploration of these ideas. Ultimately it is a researcher which eventually must alter the thinking and actions of our entire nation."

• **Critical Need**—"Because of the very large amounts of thrust required to reach higher supersonic speeds and provide greater range, the need for greater powered propellers has become critical," he said. "Somewhere the military interest, the manufacturers, and the NACA, working in partnership, must find ways to accelerate the process of team planning along into the useful development upon which our country's aeronautical progress depends."

The issue of engines for the development of propellers capable of driving airplanes for sustained flight at speeds around Mach 2 was a dominant topic both in the formal NACA discussion and an informal comment by military and aircraft industry representatives.

Although NACA sees its greatest engine research effort as being concentrated in jet it is evident from the



RAJAJET MISSILE MODEL is tested for Mach 2 tests at 50,000 ft standard altitude.



COMBUSTION CHAMBER tests over 1,000 deg stress operation, tube deposits, efficiency.



HIGH-EFFICIENCY COMPRESSOR is introduced for additional pressure, temperature data.

usage of the Lewis Laboratory's engine program that development of a practical atomic powerplant for aircraft is progressing faster than at land-based projects.

• **Connected Effort**—"The performance capabilities to be realized from increasing engine output for aircraft propulsion would be meeting supersonic flight to our goal on the face of the earth and return," Maspero told his audience. "With no large gas the gas industry, the Atomic Energy Commission, the military services and NACA are participating in separate, national attacks on the fundamental technical problems that must be solved." (Aviation Week News 26, p. 20).

"We are moving toward a clearly defined goal we know we can eventually reach," said Maspero, assistant director of the Lewis Laboratory. "We now know the technical problems that must be solved and we know that they can be solved."

"Now the rate of progress will depend largely on how much time, energy and money is applied to the program."

Much of the NACA engine powerplant research is devoted to the search for suitable material to provide light weight shielding from various types of subsonic and supersonic flow.

NACA scientists defined the problem of producing a turbine capable of powering aircraft at sustained high speed as getting a powerplant that will produce maximum power in a small lightweight package, with a combination of high operating efficiency and low fuel consumption to deliver sufficient light weight for practical aircraft use.

• **Weight Factor**—"The problem of engine development is becoming more acute as the ratio of thrust aircraft engine from Mach 1 to Mach 2, because the combination of engine weight and fuel is being a higher percentage of total aircraft weight as speeds increase."

For Mach 2 aircraft, engine and fuel weight will account for as much as 60% to 70% of the total gross weight at takeoff.

Among the trends in turbine development leading to Mach 2 performance the NACA researchers cited the following:

• **Compressor**—Basic design changes aimed at handling a larger mass airflow with a relatively small frontal area of the engine.

Among the powerful experiments in compressor design resulting in increased mass airflow are increased blade length and reduced rotor hub diameter; increased blade speeds; and increasing in-

let guide vanes to increase airflow.

• **Combustion chamber**—New design in combustion chambers are required to sustain burning at the increased air velocity provided by more efficient compressors. New blade patterns in the flame tube liner and a somewhat thicker combustion chamber design are promising trends toward flame tubes that can function efficiently at short times in the air velocity of several engines.

• **Turbine**—Higher gas temperatures through the turbine mean higher thrust NACA has explored methods of allowing increased gas temperatures over the turbine by using new heat resistant alloys and ceramic blade coatings and also by increasing the turbine blades in length.

• **Shockwave control**—NACA has also developed methods with shock waves (shock waves) as a method of increasing turbine efficiency at speeds up to Mach 2 by using an adjustable diaphragm to permit and stabilize the shockwave in the engine air intake. It was shown to the congress that one used to dampen shock in the engine that would result in turbine shockwaves. From these experiments NACA also has developed a special automatic control for engine.

• **New fuels**—Increased mass flow through operating at increased speeds means as just how much fuel better heat content than the present JP4 military jet fuel. NACA researchers believe they see possibilities of eventually using some metals and metal hydrides that have higher heat contents than the hydrocarbon-rich jet gasoline and JP4 as a source of fuel.

NACA also is exploring new types of rocket engine fuels with higher specific energy and a working on methods of building new rocket fuels to improve molecular structure.

• **Jet engine fuels**—NACA seeks for a new fuel has been expanded to include rocket engines and has yielded a novel jet engine starting system that draws gas pressure in a preheating the spectra of atomic fuels where large quantities of fuel are supported in liquid form at takeoff conditions.

NACA research has produced a pressure water spray system that cools the potential engine parts at a takeoff at the moment of engine impact and before that as an aircraft with the vaporous fuel clouds that follow impact of the aircraft.

• **Reverse thrust**—NACA has developed a new variation of reverse thrust mechanism.

The new device, currently under development, when it moved a pushed F-44 directly backward, including it was developing about 50% more thrust.

AF, Navy Aircraft Obligations Still Lag

Obligation of funds for aircraft and related procurement continued to lag through April, despite active Air Force and Navy plans deeply to accelerate contract letting (AVIATION WEEK Feb. 15, p. 17).

AF's obligations of funds during April totaled obligations by \$24 million. Navy's net obligations were only \$4 million.

As of May 1, the two services had \$2.5 billion added to obligated since procurement funds on hand. USAF \$5.9 billion, and Navy \$3.4 billion.

• **Commerce Insurance**—This means the two services will finish fiscal 1954 (see 18) with a really sizable surplus of unobligated procurement funds. Thus the \$2.1 billion contemplated Jan. 1955 when the new fiscal 1955 budget was submitted to Congress.

At that time, Assistant Secretary of Defense for Procurement estimated USAF's carryover into fiscal 1955 would be \$1.8 billion, and the Navy was expected to have a "normal" carryover of approximately \$500 million.

There is a significant procurement funds backlog, indicating a lag in moving forward with new production, is understood to be the major factor stimulating a month's investigation time of aircraft and engine plants by a top-level Air Force team, headed by Roger Egan, Assistant Secretary for Material.

Members of the team: Gen. E. W. Rusk, commander, Air Materiel Command; 1st Gen. Brent Bostick, commander, Air Materiel Command; Maj. Gen. C. B. Smith, AFMC Deputy Commander; 1st Gen. Donald Pratt, Deputy Chief of Staff for Development; 1st Gen. Thomas Power, Commander, Air Materiel Command; 1st Gen. William T. Trower, Chief, Special Assistant to the Secretary of the Air Force for Research and Development.

• **A comparison** with last year's procurement record highlights the situation here.

• **During 10 months** of fiscal 1954 USAF net obligations totaled \$770 million, for aircraft and related procurement. This compares with \$6.8 billion for the same fiscal 1953 period.

• **Navy obligated a \$417 million** net for plane procurement during the 10 months of fiscal 1954, compared with \$29 billion for the same fiscal 1953 period.

Meanwhile, USAF and Navy expenditures for aircraft and related procurement continued at a high rate and probably will reach a \$9-billion total for fiscal 1954, much of the \$5 billion obligated.

During the last 10 months of the year, expenditures totaled \$7.5 billion



STUBBY AND SKYWALK, highest lightweight Navy attack plane, stands high off the ground on tricycle landing gear.

New A4D Designed to Outperform MiG-15



LARGE INTAKES behind Skyhawk's cockpit (top right) Wright J65-W-2 Supracat turbojet.

El Segundo—The Navy last week announced the smallest and lightest U.S. jet combat plane yet revealed: the Douglas A4D Skyhawk.

The single-engine, through-wing, modest atomic bomber is so small it will fit within the folded wingspan of a traditional Navy carrier-based plane.

Yet, it has been designed to fly past atop across the continent and will have a speed greater than Russian MiG-15 fighters.

The Skyhawk is an epitome of design, light weight and low cost is the end product of the philosophy of its chief designer, Ed Heinemann, and Douglas Aircraft Co.

Although security appearance would not permit disclosure of detailed specifications or performance, Heinemann told newsmen the stubby bomber is a little less than half the weight of many current operational jet fighters which weigh in at about 35,000 lb., has a wingspan between 26 and 28 ft., and is approximately 35 ft. long. Powerplant is a single Wright J65-W-2 turbo-



ATTACK PLANE CONTRAST: The Douglas A4D Skyhawk and big twin jet Douglas A3D Skywarrior show different shapes and sizes.

jet rated at more than 7,200 lb thrust. "Under our program of design simplification," he said, "the A4D gained 33% more in speed and a third more in range than was at first thought possible."

► **Subsonic Speed**—Its speed is designed to be subsonic in level flight, the El Segundo Division chief engineer said, but it will be tested at supersonic speeds in dives.

An announcement cleared by Navy disclosed:

- It will fly faster over greater distances with a more powerful striking load than any airplane of its type. Construction is of aluminum alloy.
- It has a combat radius greater than present propeller-driven attack airplanes.
- It has been designed to operate from all types of Navy carriers and from short landing fields.
- Most Skyhawks can be stored in an aircraft carrier's fold-down planes.
- It is capable of carrying atomic bombs or rockets, machineguns, missiles and other weapons to suit the wide variety of missions of attack-type airplanes.

The tiny bomber, nicknamed the Heinemann "Hot Rod," rolled out of the Douglas plant only 19 months after it was conceived, Heinemann said. It is due to make its maiden flight later this week.

"The chief engineer said he had long felt there was a need for a smaller, lower-cost airplane to carry the modern A-bomb and enough electronic gear to operate under all weather conditions."

"The A4D is believed to be a simple thing in designing an airplane on a completely functional basis, making out a subsequent stand on its own feet rather than in doing things because they have been done that way in the past," he said.

► **Equipment Simplified**—Its radar suite, its airplane, Heinemann said, weight savings had to be achieved through emphasis upon simplification. Gives a free hand by the Navy, he has fought against extra weight on every conceivable article in the plane.

► **Packaging communications equipment** including IFF equipment into one compact aluminum case saved approximately 165 lb. on the stern alone.

► **Weighting**, which weighs 35 lb. in other aircraft, has been cut to only 6 lb.

► **New engine** and weight approximately 35 lb. as compared with about 70 lb., weight of the lightest now new

being used. It is made up of only 88 parts, whereas current models contain 240, Heinemann said.

► **Air conditioning system** is said to be one-third the weight of the type formerly used.

Heinemann paid tribute to Navy's BuAer for assistance in re-designing component components to make the Skyhawk's simplification program possible. "Revolutionary techniques" in engineering, tooling and production have permitted A4D line production to start immediately. An unbroken number by service but a new one, the company disclosed, and not be involved in the time normally required to build one experimental airplane.

► **Tailored Cockpit**—Test pilot Bob Rahn said when he saw the first mock-up of the cockpit plane he immediately "knew" was the cockpit. "To use it I would fit." Actually, there was plenty of room. They've tailored the cockpit without sacrificing comfort and convenience of the pilot, he said.

Navy said the lightweight design philosophy incorporated in the A4D should open a new era of high-performance jet attack airplanes not thought possible a few years ago.

Layoffs Hit Piasecki As AF Grounds H-21

As Air Force order grounding the H-21 Work Horse for a second time is forcing layoff of several hundred Piasecki Helicopter Corp. employees at the Meriden, Pa., plant. Action was taken about last month at Edwards AFB, Calif., but a blade after 27 modifications had been accepted (Aviation Week June 7, p. 11).

Spokesman for Piasecki last week said the new grounding order has forced a revision of the H-21 production schedule, slowing production until all modifications are frozen and can be incorporated into the helicopter on the production line. Work hours output

had been mentioned on schedule, but the groundings have resulted in a large backlog of completed models due cannot be flown from the plant until engines are completed.

► **Layoff**—Indefinite—Don R. Butler, president of the company, and he had to say how long the layoff would last. More than 100 production workers were given their notices June 4, and Butler said the layoff would continue "for the next two weeks."

Piasecki early this year had approximately 4,500 employees and most of the assembly line workers have been on the H-21 project in contracts for the Navy and Army. H-21S plans placed out last H-21 is scheduled for delivery this month.

► **Antenna**—Lenses—The initial H-21

grounding order was issued Feb. 16, on the eve of an accident near Tuck Point, Quebec, in which two USAF pilots and a Piasecki service representative were killed. The second grounding order was dated May 17, Berlin disclosed.

"This is an operation which I don't like," Butler told the employees, "but it is apparent that there is no way by which it can be prevented."

In addition to the Meriden plant, Piasecki recently leased 245,000 sq ft. of space in Ardmore, Pa., where the company plans to manufacture some components now made by subcontractors.

A hiring program for the new facility is expected to get under way this summer.



CAPITAL'S TURBOPROP VISCOUNTS will look like this when the new British transports go into service as U. S. next April.

Capital Airlines Buys Turboprops

British Crack U.S. Market With Viscounts

Valdens-Aeromarine, Ltd., of Gent Britain has made a major penetration of the U. S. airline equipment market with the sale of three turboprop Viscounts and options for 57 more to Capital Airlines. These are the first turboprop transports purchased by a U. S. airline.

The purchase could prove a significant blow to the U. S. aircraft industry, particularly since it is the second time in two years a foreign aircraft maker has cracked the market in this country with transport orders of more than 100 transports. Pan American World Airways has ordered three de Havilland Comet 3s with an option for an additional seven (Aviation Week Oct. 27, 1952, p. 17).

Capital's action is taken as a warning to U. S. manufacturers who for many years have enjoyed a monopoly on domestic airline equipment. Many of these companies admit to more than mild concern, fearing the move could mean the start of an industry lull.

■ **547 Million Deal.**—Capital president J. H. Carmichael says the Viscount deal "amounts to \$47 million," including 15% export duty. He says similar export agreements for financing have been made, although he declines to reveal exact terms.

"The financing arrangements are mutually satisfactory," he told Aviation Week. "It is a perfectly sound business deal with no prejudice involved. The arrangements provide

efficient capital to fund the entire program."

■ **Early Delivery.**—The British were quick to give their new found advantage by promising early delivery of the first three Viscounts. Valdens reports delivery has been hastened by British European Airways' request to postpone part of three of its Viscounts in favor of Capital. BEA notes it is doing this "in the national interest."

The initial turboprop planes are scheduled for delivery next year. These will be the 750 model. Other 57 Viscounts will be the 730-D type, delivery of which will begin early in 1955 and be completed late in 1957.

Carmichael explains that there is little doubt Capital will receive its option for the additional 57 in full operation, the Viscount is the answer for airlines flying intercontinental routes such as those of Capital. He says there is no comparable transport available in this country that will do the job.

Reports indicate, however, that another U. S. airline that might decide to get into the Viscount picture would have definite delivery difficulties before one to one-and-a-half years. Current orders for the aircraft now total more than 100.

As for Civil Aeronautics Administration tests, Carmichael anticipates no trouble. "We did not see the CAA certification from in England, but while I was there I did not hear of any problems involved in the certification of the aircraft." The firm is expected to make a recommendation to CAA Administrator Paul B. Lee this month.

■ **Outstanding Record.**—Carmichael says Capital has been searching around for a suitable market for its assets and called the Viscount's operating record "outstanding."

"There will be no section of our system where we cannot compete with other domestic airlines, and in a few sections we will be able to better them," he adds. "The Viscount still has further development ahead of it and gradually will improve its performance with experience."

It points out that no more than 65% of Capital's route structure "we compete with the 'Big Four,' and you can't do this successfully without a certain degree of success."

■ **Safe Potential.**—"It is an endorsement of the traffic-potential of the Viscount. It will be completely competitive with the DC-7 and the Super Constellation and a standard of service that will not be exceeded in our area."

■ **High-Speed.**—Powered by four Rolls-Royce Dart turboprops, the Viscount cruises at about 315 mph, and CAA expects to see short time with certain aspects of its system be a considerable margin.

The company president says the run from New York to Cleveland, for example, which now takes 1 hr. 35 min., will be made in 1 hr. 31 min. Between Detroit and Washington, the Viscount will be able to establish a schedule of 1 hr., 28 min., compared with one hour, 24 min. operation.

Carmichael believes a big factor in promoting the Viscount will be its vibrationless performance. And the fact the turbine engine provides a lower noise level than piston-powered planes also should have strong passenger appeal, he says.

■ **First Presentation.**—Life is particularly enthusiastic over the British presentation series in the Viscount, calling it the first time it has been seen in this country. He says one can see between London and Copenhagen, a distance equivalent to Capital's New York-Chicago run.

"We flew in Copenhagen at an altitude of about 26,000 ft., returned in London at about 25,000 ft., then made our descent at the rate of about 5,000 ft. per min. with no noticeable effects what so ever."

While the presentation system in British, all maintenance, cargo, fuel and radio are for Capital's planes will be U. S. manufactured. All maintenance will be made at Valdens, however, with 84 planes delivered complete in this country.

■ **First-Class Service.**—Carmichael says service will be started as late as next April.

The first Viscounts will be used for first-class service, exclusively under present plans, with seating capacity of 45. Seating can be increased to 56, if and when the planes are without the aircraft.

The Capital chief executive says he feels it is a "highly significant" that with a 44-seat configuration the plane can operate with a 56.6% load factor in the four-engine pattern. With the six-engine configuration, seating would be less than 50 seats, but with 56 seats, only if each engine is authorized.

As the Viscounts are delivered, they will replace CAA's Constellation line, then at DC-4s, finally at DC-3s.

"The airplane," Carmichael says, "comes closer than any other in present

ing as to standard by using the same engine and one plane. This will give us a cost reduction and greater efficiency in our operations."

■ **Safe Potential.**—"It is an endorsement of the traffic-potential of the Viscount. It will be completely competitive with the DC-7 and the Super Constellation and a standard of service that will not be exceeded in our area."

The plane, he says, "sells itself." It is luxurious and captures the imagination. The plane has reached its high point and the development of the air supports that the turboprop is used. Capital is proud to be the first to introduce the turboprop on airlines in the U. S.

He adds that while Capital is aware of other developments in the transport field, "we did not look at any other plane while we were in England." Carmichael says his airline has been looking for a plane that "meets our requirements and the Viscount is it. I couldn't be more pleased with the aircraft if it had been designed to our specifications."

■ **Overhaul Center.**—Capital has not revealed definite plans for maintenance of the new planes, but expects overhaul for the first three will be handled by Rolls-Royce at Darby, England. "This month we will develop our own overhaul center in Washington," Carmichael says.

Overhaul paid for the Dart is 750

hr., but Capital expects to extend that to at least 100,000 hr. by the time its Viscounts are in full operation.

"We will send our technicians and maintenance people to England for instruction and they in turn will send an instructor for the rest of our maintenance crew."

Robert V. Quirk, president of British IFA, International Association of Manufacturers of Capital, told Aviation Week he has not had an opportunity to discuss the Viscount purchase with CAA management.

■ **Crew Training.**—Valdens will train Capital crews initially, with chief pilots and test pilots going to England. There will be a minimum of eight trained in England, possibly 12, Carmichael says.

"Pilot trained in England does not need an instructor for others. The transition for pilots is simple and quick," Carmichael explains. "There is nothing complex about flying the Viscount."

Arrangements for obtaining spare parts reportedly have been worked out, but Capital officials decline comment at this time. Valdens reportedly has offered to establish a spare parts depot in this country, where CAA would pay only for parts transported from the depot. In this way, the airline would not need the expense of maintaining a sizable spare inventory.

■ **Turboprop Impact.**—Reaction throughout the industry to Capital's



CAPITAL'S ROUTES, with medium-to-short segments, are particularly suitable in Viscount.

vacuum package have been varied.

One major troublemaker reports it is taking another look at the Vacucoat as an effort to determine just what Comanche is going to do with it. A spokesman says, "We got Vacucoat blowdown all over my desk and have lost them there for the past several days."

He notes that is a pretty normal reaction when a competitor loses a new product.

It also has been noted that if CAF does go through with its plans to use all 90 Vacucoat and 10 in its varied fleet of Comanches, DC-9s and DC-8s, the future should be in an excellent position in two counts.

- Maintenance and spare parts planning can be produced on one type of airframe and engine.

- The problem of spare aircraft will be eased greatly in the event of the breakdown of transports scheduled for flights. The Vacucoat would be the replacement in all instances, offering the same schedule, speed and performance of the aircraft replaced.

It also is noted that CAF will be in an excellent position to arrange and interchange with Trans-Canada Air Lines at Small Size, Minor, a point served by both services. This would provide passengers with through Vacucoat service, since TCA is scheduled to start turboprop operations early next year. First of TCA's 15 Vacucoat is due September.

Another reaction to CAF's purchase came from a big-time Washington observer. "I'm glad to see the Vacucoat get into this country. Maybe it will make up U. S. manufacturers to the need for a real good transport aircraft. Every plane we've received as far as quality has been degraded for the military, all we get is a modification of the military version."

Reverser Takes Three Forms

Siemens, France's automated aircraft engine factory, has developed at least three variants of its jet thrust reverser, namely a convertible, a smaller size unit for deflecting the turbine exhaust forward (Aviation Week, Apr. 12, p. 18). The three versions:

- **Type I** is a retractable installation normally housed between the tail cone and its surrounding cowling. For reverse thrust braking action the cylinder of a piston moves the cylinder of a piston through the cowling.

- **Type II** is similar except that it is not retractable. It is detachable, however, and is stored in the tail cone end with a metal strap.

Nonskeds' Role

- **CAB bureau proposes 5-yr. charter certificate.**
- **Only qualified airlines would win new licenses.**

Temporary certification of qualified regular airlines to perform bona fide charter services was recommended last week by Civil Aeronautics Board's Bureau of Air Operations.

Butler, counsel, Marvin J. Bagan, in a statement of BAO's position in the long-nosed investigation, recommended against granting certificates as exceptions to any of the applicants to provide transportation for individual named persons or individual deposits of property. The statement is the first position taken by the bureau since the investigation started in September 1952.

The recommendation states: "The public convenience and necessity require the establishment of a class of air carrier to provide bona fide charter service for the transportation of persons or articles and property as shippers and consignees or transportation."

- **Certification**—Following criteria were recommended by the bureau in selection of airlines for certification:

- Extent of the airline's experience in successfully providing recommended services.
- Extent to which the previous operating history of the airline has demonstrated acquisition of its common carrier obligations to the public.
- Carrier's previous record of compliance with the Board's regulations and

those of other government agencies.

Transportation as an individual business as proposed by the applicants is not "additional and supplemental" to the scheduled, non-stop service provided by the presently certificated air carriers," BAO said.

"This service would parallel that performed by the presently certificated air carriers, since, to be economically feasible, it must be concentrated on high-density route systems where increased service on an individual basis has a slender argument."

- **Conditions**—Certificates would be subject to the following conditions and limitations under BAO recommendations:

- Nonskeds should be classified as "air related charter carriers."
- Each certificate should include authority for the transportation of both persons and property.
- Certificates should be for a temporary period of five years.
- Certificates should not be issued as to frequency and regularity of service.

- **Within the recommended authority**, certificates should not be limited as to base of operations or areas in which operations may be conducted.

- **Charters**—BAO's definition of bona fide charter means: "Bona fide charter" contemplates the contracting of the entire capacity of an aircraft for the movement of persons and their baggage, or for the movement of property, or both, on a bare, package or trip basis.

"Such a charter does not contemplate solicitation by the carrier, its agent or a group thereof or consolidating intermediary of individual persons to make up a charter group, or of individual segments of cargo to make up a planned volume of property. Thus, ticket agents, passenger forwarders, airfreight forwarders and other group booking or consolidating agencies would be prohibited from chartering aircraft."

"In connection with group charters and the question of whether individual solicitation occurs, it is appropriate to discuss, among other things, whether the group is a pre-existing group and has a common purpose beyond that of obtaining the transportation itself."

Special ACC Study

An Coordinating Committee's special working group on marking and lighting of tall structures hazardous to air navigation will hold hearings in Washington, D. C., June 24 and 25.

This is the first phase of the group's current study to determine if existing national standards on obstruction lighting and marking are adequate for tall structures.

Moment of Decision

This is V/J Speed. With runway space running out at nearly 200 feet per second... the pilot's Moment of Decision has come. If take-off has to be rejected he is faced with the ultimate problem of all heavier-than-air flight—the ability to stop.

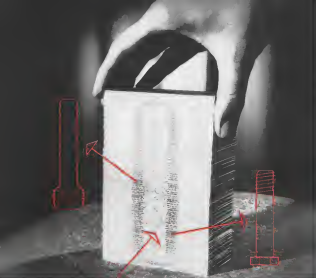
In either rejected take-offs or the thousand-and-one hazards of landing, the pilot's judgment is made immeasurably safer and more sure by the knowledge that he has HYDRO, Hydro-Aire's proven Anti-Skid Braking System. HYDRO reduces his maximum stopping distance 30% or more. On dry runways stops have been made with service within 50 feet of scheduled distances for dry runway conditions.

HYDRO is light, easy to install, compatible with existing brake systems. Its cost is negligible compared to the value of the equipment it will protect.

If your investment in aircraft, your operating efficiency and your reputation are not already protected by the extra safety margin of HYDRO, the time to contact HYDRO-AIRE is now.

This is your Moment of Decision.

HYDRO-AIRE
HYDRO-AIRE, Inc.
WEBBANK, CALIF. Subsidiary of Crown Co.



Martin Aircraft Forms Solid Ingots of Scrap Sheet Titanium with Sciaky Spotwelder

The Manufacturing Research and Development Unit of the Glenn L. Martin Company has developed a technique to utilize virtually all their scrap sheet titanium. A six inch pile of 80 laminations of .004 titanium with two laminations at each end of .011 titanium is joined with one weld on a Sciaky type T30CG-8RT 800 KVA Three-Phase Spot Welder. The weld nugget forms a solid ingot of virgin metal at least as strong as the parent metal. This ingot can be machined into a variety of titanium parts. An expensive waste is almost entirely eliminated, and the months of lead time required for delivery of titanium for machining is avoided. Martin Research offers another fine example of Sciaky laser thinking in design with resistance welding equipment to do more useful work at the lowest operating cost with maximum reliability.

Largest Manufacturers of Electric Resistance Welding Machines in the World

SEI AKY

4912 West 47th Street, Chicago 35, Illinois



SWEEP TAIL marks new Aero Commander 560 business plane, now in production.

Aero Commander Gets Sweep Tail

A new swept-tail Aero Commander business plane, the Model 560, has been put into production by Aero Design & Engineering Corp., Bedford, Ohio.

The faster, heavier 560 replaces the Model 520. It is priced at \$69,500, is the standard model, four-seater, four-cylinder, 180-hp engine.

Seating is from five to seven, with an individual arrangement for six possible by placing one by each window. Seats can be removed quickly for cargo carrying, taking room for more than 2,000 lb. of payload.

Powerplant—The Aero Commander 560 is powered by two Lycoming GO-560B four-cylinder, 180-hp engines, with a takeoff rating of 200 hp. Engines have chrome-plated rings for longer service life.

A new engine governor, more eight or nine pounds lighter than the previous type, is installed. Two are used as standard equipment. The 50-wp. 100-wp. generator is designed to run at 8,000 rpm.

Inside the engine cooling is a newly developed air induction system, providing a filtered airflow to the carburetor. A grid at the carburetor neck straightens airflow and provides extra fuel distribution to the cylinders, helping keep

cylinder temperatures down.

Performance—Top speed at 5,500 ft. is given as 209 mph, service ceiling at that weight is 12,500 ft. At 6,000 ft., service ceiling with one prop feathered is 8,800 ft.

Two-engine rate of climb at sea level at 6,000 ft. is 1,140 fpm, and 525 fpm with one engine feathered. Sea level power-off stall speed at maximum load with landing gear and flaps extended is 50 mph.

Equipment—Included in the \$69,500 price is standard equipment: an emergency exit, lateral control locks and a tow bar. These formerly were optional.

Other standard items are full-time wing, aileron, flap, and rudder, a full set of aileron, flap, and rudder, and a Lear 17RA-5 radio that has a VHF transmitter and receiver and a low-frequency receiver.

Also standard on the new plane is an auxiliary hydraulic system so that, in an emergency, fluid can be manually pumped from a reserve tank to operate flaps and brakes.

The Aero Commander's power steering has been improved by increasing travel of the nosewheel to 28 deg. A heavier steering cylinder pattern has been installed in this system.

Argentina Will Spend \$82 Million on Planes

(McClure-Hill World News)

Buenos Aires—Argentina plans to spend at least \$82 million by the end of 1957 on development and production of aircraft, including a new turbo-propeller plane expected to reach speeds of more than 750 mph.

The Ministry of Aviation will put

the expensive aircraft on the assembly lines of the large government-owned Industriales Aeronauticas y Mecanicas del Estado at Cordoba after the prototype model, now undergoing wind-tunnel tests, completes its test program.

Argentine Design-Production scholar set up by the Ministry under the new spending program also will for IAMER manufacture of three Argentine-designed aircraft.

Polique 2, chosen by the government to be one of the most modern jets of

you can DEPEND ON ZEP OXYGEN EQUIPMENT

All types of oxygen equipment supplied by Zep are the latest approved types of all new products. The equipment is available for use by airline manufacturers and existing aircraft owners.



Government approved system for breathing and servicing of military aircraft oxygen equipment.

Complete Oxygen Equipment Catalog Available on Request

CAA Approved Oxygen Repair Station 4473



180-186 Sheldon Street, El Segundo, Calif.
8000 4-1100

Vard

Specialists

IN CUSTOM GEARING FOR INDUSTRY



VARD
hardened and ground
**DOUBLE ENVELOPING
WORMS** are produced by
an extensive process which
provides accuracy of con-
tact, surface finish and
hardness unobtainable
by other manufacturing
methods.

Consider these advantages
of **VARD** hardened and
ground double enveloping
worm and gear sets

- Custom design
- Production quantities
- Interchangeability
- Accuracy of control
- Higher efficiency
- Economy of space and weight
- Special gear materials

Vard

INC. PASADENA 8 CALIFORNIA

in class in the world. It will be mass produced shortly, according to an official announcement.

• **Jet-powered** the A-14-75, one of the country's best propeller-driven aircraft. Powered by the locally built 100-hp 21 turbo engine, this plane is destined for both military and civil operations. A hundred are under construction.

• **Two-place civil plane**, to be designed along lines set by the results of a survey of the Argentine's flying clubs that now is nearing completion. The Ministry is preparing for mass production of this lightplane.

• **Kazachok Lark**—The successful development program faces possible setbacks because of the country's dependence on imports for essential parts and materials plus a serious lack of necessary know-how.

More than 1,400 tons of equipment, aircraft engines, parts and accessories ordered by the Ministry of Aviation arrived last from New York last month. But the continued shortage of dollar exchange does not enable IAME to purchase these in volume quantities with even minimum production costs.

London Airport Builds \$100-Million Terminal

(McGraw-Hill World News)
London—Few passengers heading at London Airport notice the stand of heavy modern construction taking place in the middle of the field. They are too startled at the daily construction activities of temporary structures that preside so easily away as the airport's present main terminal buildings.

Construction of what is billed as the world's most modern air transportation port under 5100 million—a well advanced. The central control tower and main airport operational offices already are housed up, backed and glazed in and are expected to go into operation near the end of the year.

• **Airline Facilities**—The Southeast Free Building is about half done, with six of the 10 planned passenger elements expected to be in operation by March 1955.

The Eastern Apex Building is having its steel structure erected and is not expected to be ready for occupancy and use before December 1955. This building will house the airport's operational rooms, customs clearance for cargo and—on the roof—a new theater, radio room, ball, etc., for the general public.

• **Tunnel Approach**—The main terminal area, centered in the middle of the airfield, is approached through a 1,600-ft tunnel under one of the main runways.

This tunnel is 85 ft wide and has 33 ft clearance in the motor vehicle



STRATOPOWER Is Ready for the Planes Which Will Break Through Today's Ceilings

The modern STRATOPOWER Hydraulic Pumps are ready and able to perform efficiently well beyond heights penetrated by piloted aircraft. They've proved it in Rockets. Guided Missiles and under the simulated conditions of the atmosphere STRATOPOWER Pumps pump! They are built to perform at full efficiency and with complete dependability under the extreme conditions and variables imposed by projected speeds and service ceilings.

STRATOPOWER Pumps draw fluid from unpressurized reservoirs to maintain system pressure at altitudes where other pumps, dependent upon pressurized reservoirs, would be unable to supply system demands. Thus, they afford that vital added safety factor for high altitude operation . . . system saturation is assured, even though reservoir pressure may be lost.



SERIES 66W PRESSURE COMPENSATED HYDRAULIC PUMPS

Designed to simplify hydraulic systems and to reduce the servicing cost of such systems, these pumps deliver a range of output in three available delivery rates. Includes spare delivery rate from 1 to 12 gpm at 1000 psi with operating pressures to 1000 psi and speeds to 4000 rpm.

There is a STRATOPOWER Hydraulic Pump to provide the efficient source of fluid power for your equipment. Write for full information today.

WATERTOWN DIVISION
THE NEW YORK AIR BRAKE COMPANY
705 Blackhawk Ave., Watertown, N. Y.

Please send me full information on STRATOPOWER Hydraulic Pumps.

Name

Address

City State

WATERTOWN DIVISION
THE NEW YORK AIR BRAKE COMPANY
STARBURG AVENUE • WATERTOWN - N. Y.

The New, Versatile, Accurate T-60 Pacific TENSIO METER



— makes control cable
tension reading
easy and accurate!

Backed by 13 years of experience, the new T-60 Pacific Tensiometer introduced many new features and improvements suggested by users and maintenance personnel.

Check these points:

NEW FAST-TO-READ DIAL

shows tension in pounds instantly

NEW SCIENTIFIC DESIGN

allows easier access to sight glass

NEW BUILT-IN LOCK

prevents use where measurements cannot be taken

NEW VERSATILITY

for use on both primary and secondary cables Model T-60-150 L/C covers tensions from 150 to 200 lbs. and T-60-1800 L/C covers tensions from 150 lbs. to 1800 lbs. Over range use will not damage the instrument.

Standard T-60 models are also available to measure secondary cable tension up to 500 lbs. and primary cable tension to 2200 lbs.

A colorful new bulletin telling all about the new T-60 is now available.

Pacific SCIENTIFIC CO.

1420 Grande Vista Ave., Los Angeles 23, Calif.
100 Madison Ave., New Rochelle 7, California
1112 34 Avenue South, Seattle 4, Washington
2111 East 10th Street, Portland 1, Oregon
SACRAMENTO, CALIFORNIA: 4400 SUNDOWN DR.
SANTA ANA, CALIF.: 1000 SUNDOWN DR.

systems. It includes one for both air board and air surfaced traffic lanes, 10-ft wide motor vehicle traffic lanes, a vehicle lane and a bus-lane.

At peak hours, it is estimated that it can handle 2,000 motor vehicles an hour in each direction.

► **4 Million Passengers**—By 1960 passenger estimates say that the airport will have to handle 4.5 million air travel passengers a year. For this reason nearly three miles of the terminal terminal area have been left open to future development, although the general configuration of future buildings has been decided.

Because of the unique layout of the field, all four sides of the terminal area on landing or taxiway remain open. This airport is set up as a twin parallel runway system—one each for mixed traffic, takeoff and landing.

In addition to the taxiway, there are four vehicle entryways that permit buses to take air passengers to and from aircraft parked on the far side of the apron without having to cross dangerous parking and taxiways.

Convair Official Urges Air Supply Speedup

Los Angeles—In order to do the job needed by our nation's future highway program, emphasis should be placed on clearing the road tops of getting men and material into the field and the need for speedy transportation of troops and supplies once they have been acquired.

Charles F. Horne, manager of the Pomona, Calif., plant of Convair Division of General Dynamics Corp., gave this warning to the Los Angeles Club

of the National Defense Transportation Association at a recent meeting.

► **Speeding the Flow**—Speaking before the group responsible for keeping the nation's transport facilities ready for any emergency, Horne urged use of electronic memory devices to speed the flow of information and data in and from fringe areas as a means of reducing paper work presently handled manually.

"The faster delivery of supplies by means of global transport, coupled with the speed of information flow made possible by electronic methods, will result in a great reduction in our supply problems," he said.

"There will be fewer days of supply, and each day's supply will be smaller. We currently need more than 200 days of supply in one worldwide problem to meet a day's supply to field units. Each day of supply we can eliminate by speeding information and material—our savings of millions of dollars."

► **Anticipating Needs**—According to the electronic memory devices now under development, Horne said they virtually would eliminate paper work, reduce information flow time from months to seconds, and reduce uncertainties and unreliability of data.

"These machines will take a field commander's requests to the point of supply, regardless of distance, in seconds and keep a complete check-and-balance at the same time. Moreover, under special conditions, they will actually anticipate the commander's requirements and do the ordering for him," Horne predicted.

The electronic system, he said, would require a relatively small number of machines—probably one at each base, one at each depot and several at a



Five Canberras—All Different

Here are five different versions of the first English Electric Canberra. From background to front plane: FR.3, leader

FR.4, bomber T.4, photo-sensor FR.5 and the bomber B.2. The company produces the Canberras at Farnborough.

COLD 50° F LOWER THAN MT. EVEREST'S CAN'T FAZE THIS G-E SILICONE RUBBER!

G-E CLASS 500 silicone rubber retains flexibility at -120 F

Specifically designed for high-altitude and arctic aircraft applications, General Electric CLASS 500 silicone rubber compounds have become the standard in the industry. Unmatched in low-temperature serviceability by any known elastomer, including other silicone rubbers, they make ideal gaskets and seals for airframe openings, aerodynamic balance surfaces, ignition cable, external limit switch covers and other applications where low-temperature operation is vital. When you specify General Electric CLASS 500 silicone rubber, you can count on properties such as these:

- ★ Flexibility at 120 degrees below zero F
- ★ Low compression set and quick recovery at sub-zero temperatures
- ★ Serviceability over a 600-degree range (-120 to 500 F)
- ★ No plasticizers to leech out at high temperatures

Ask your fabricator

about G-E CLASS 500 silicone rubber for low-temperature applications! Compounds are available in a variety of hardnesses, at special compounds can be made to your exact specifications from G-E silicone gels. For the names of experienced fabricators and for complete technical data, just send the coupon:

See your "Short's File for Product Descriptions" for complete details on G-E elastomers.

G-E silicones

fit in your future

GENERAL ELECTRIC



General Electric Company

Electric Building

Waterford, New York

Please send me product data on G-E CLASS 500 silicone rubber, including a list of companies with silicone rubber used by them. I am chiefly interested in:

- | | |
|-------------------------------|--------------------------------|
| () Molded parts, including | () Extruded seals, tubing |
| () Sheet stock, films, tapes | () Reinforced tubing, hoses |
| () Wire and cable insulation | () Wire and cable assemblies |
| () Special products | () Coated tapes, cloth, films |

Name _____ Position _____

Firm _____

Street _____

City _____ State _____

Zip _____

10-500000-001-001 General Electric Company, Inc., Syracuse

...another

CRITICAL FASTENING PROBLEM

solved by **Delron**



problem: Lockheed engineers required a strong, lightweight bolt spacer for fast, economical installation of aluminum honeycomb structure in the famous Super Comanche. The bolt connector eliminated is no example. Large quantity of fasteners to be used required low weight per unit, and had to be adaptable to mass production as well as manual installation.

solution: Delron's Penco Spacers were tested by Lockheed and were then met requirements of the critical fastening job. On each Super Comanche, approximately 3000 Spacers are used, providing back column strength with a bolt weight of only 12 pounds. Post 300 per hour installation as well as hand assembly, if required, are the reasons Penco Spacers make ideal fasteners for honeycomb type structures.

This is another example of Delron's long service and design experience in work-solving critical fastening problems!



THE DELRON COMPANY, INC.

1124 Southern Avenue, South San Francisco, California

POST 12 FROM
CRITICAL FASTENING
PROBLEM

Use this bit of our bolt spacer,
and you'll be in good luck.

- ☐ Sandwich structure fastening
- ☐ Reinforce in 1200°F. operation
- ☐ Reinforce in 1600°F. operation

Name _____

control point to control worldwide stocks.

Such an information-flow system would process the proper portion of the business of distribution, programming and control.

► **Accent on Speed**—Along with the high-speed flow of information would be an integrated transport system comprising ships, trucks, railroad cars, buses and other vehicles with the accent on speed. They would carry standard, packaged containers, the Corvair executive said.

"We now need a heavy logistics in carrier that will fit into this integrated transportation system," House said. "Military characteristics for such an aircraft already have been drawn up. The airplane would be able to land high payloads at high speeds for long distances."

Up-to-date logistics, he said, also will require less packaging, to save time, space, weight, and money.

"For certain types of combat operations," said House, "studies have shown that logistic air support costs are not possible to those incurred by sea lane transportation. Thus, the overall expense in dollars and personnel of operations like these would be maintained for the highly strategic defense and offensive capabilities possible."

He explained, "We also would effect a reduction in dispatches of men and material abroad. They would be contained on our shores, ready with fleets of globe-grinding transports to move out men and equipment at a moment's notice."

► **Supply Position**—We must recognize, he concluded, that the advent of nuclear weapons places a premium on the element of surprise, our troops must be prepared for rapid use of the capability to go into areas while the enemy still is in condition of shock from our activities.

"These troops can be quickly transported either by land-based or water-based airplanes," House said. "To get the job accomplished, it will be aerial transportation that gets the troops and the supplies to the front fastest with the greatest ease."

Bell Aircraft Pays Officers \$387,000

Lawrence D. Bell, president and general manager of Bell Aircraft Corp., received \$85,159 salary during 1973, the firm reports to the Securities & Exchange Commission.

The company paid Roy P. Whitman, first vice president, \$56,542, and Linda F. Fawcett, secretary treasurer and assistant general manager, \$50,786. All officers and directors received a combined total of \$387,007.

MB-designed suspension solves "difficult engine installation"

in Sikorsky twin-engine helicopter



when mounted.

► **Mounted at Angle**—The main rotor assembly utilizes four blades of about 45 ft. length manufactured by a process described in AVIATION WEEK (Sept. 14, 1973, p. 11).

► **Engine Installation**—One of the most difficult problems in a helicopter is the installation of the engine. The R2800 engine is mounted at an angle to the main fuselage with the main rotor assembly pointing toward the main rotor assembly. Cooling air coming in through a duct in the leading edge of the rotor hub.

Reprinted from AVIATION WEEK of January 25, 1974.



New lightweight MB mounts isolate the two P&W R2800 engines

With two engines, the Macross Corp.'s new Sikorsky SEH28 represents a major event in helicopter progress. But that great power plant had also meant double trouble in mounting. Called in on the problem, MB vibration specialists engineered a successful suspension system for the single-mounted engines. Vibration was isolated—a smooth, comfortable ride assured.

MB cooperation yielded still another benefit. The SEH28 uses the new lightweight aluminum MB engine mounts developed especially for P&W R2800 engines. Their advantage? Each mount weighs 38% less than the unit it replaced.

Participation in vibration engineering explains in part why many manufacturers rely on MB—for engine mounts and for help in application.

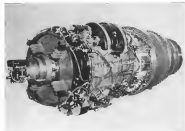
the MB manufacturing company, inc.

1080 Site Street, New Haven, Conn.

HEADQUARTERS FOR PRODUCTS TO ISOLATE VIBRATION... TO SECURE IT... TO MEASURE IT

Analysis Reveals Wright J65 Details

By Irving Stone

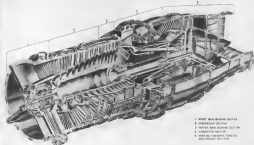


WRIGHT J65-W-1 external view shows equipment and flow. Based on Armstrong Siddeley Sapphire, J65 has official thrust rating of over 7,200 lb.

The J65 turbojet engine incorporates unusual design and production features, notably in the compressor and combustion chamber. Wright Aeronautical Division of Curtin Wright Corp., which builds the engine, has stuck very closely to the basic Sapphire engine, the Bristol counterpart originally designed and built almost by Armstrong Siddeley Motors Ltd.

First in Wright's production series is the J65-W-1, the subject of this analysis. Its official thrust rating is more than 7,200 lb. More of these engines have been built and nobody changes to conform to American standards. American-built accessories, and accessory engineering and production refinements. There are other engines in the series which also greatly follow the basic British design.

Bristol Motor Division of General Motors Corp. also is building the J65 as prime contractor to the Air Force, under license from Curtin Wright Corp. Critical Metals-la secret respects the



1. WRIGHT MAIN BEARING SECTION
2. COMPRESSION SECTION
3. WRIGHT MAIN BEARING SECTION
4. COMPRESSION SECTION
5. WRIGHT MAIN BEARING SECTION
6. COMPRESSION SECTION

J65-W-1 CUTAWAY



SCHEMATIC cross-section gives details of oil, air and fuel flow. Compressor rotor blades are not extracted between shafts.

engine offers some important savings in strategic material utilization. Thus, the rotor is used as a guide in the gas. This material normally is associated with basket materials in an alloying element.

No calculations go into the engine as an alloy to gain temperature resistance, but some is used in welding rod for the center bearing support, combustion chamber and turbine. Little tungsten is used only in the flange support ring for the combustion chamber and turbine, and in some blading support members.

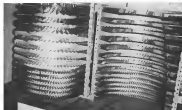
Chromium and nickel are fairly plentiful. Nickel is used in the Nienco heat-treated combustion chamber vaporizer tube, stainless steel joints, burner support, exhaust nozzle, and center bearing support. The chromium content is generally associated with parts containing the nickel.

►Front End-Air outstanding feature of the engine is its large air handling capacity per square foot of frontal area. This capability is considered very good even by the latest standards. It is obtained by the compressor design, permitting the intake and first five stages to handle air successfully at high Mach numbers.

Front main bearing support located in center entrance to the compressor section, and is supported by four ball bearings. These extend radially from the hub, 90 deg apart, covered with four bearings to form leading edges. The front main bearing is housed at the rear of the support.

►Compressor Design of the compressor is aimed at lightweight construction. There are 15 rows of rotor blades, the first seven rows comprising the low-pressure portion of the compressor and the last eight stages being the high-pressure portion.

Initially, the first seven rotor blade stages were titanium alloy, but co-



COMPRESSOR rotor (left) and stator (right). The rotor profile view and first seven stages (low pressure portion) of rotor have tips shrouded.



6500R of compressor in check fixture. Note lug blades at intake end (left).

THROUGH THE YEARS— CONSTANTLY EXPANDING FACILITIES EVER HIGHER PRODUCT QUALITY



1921, Dynamic engine test stand, a Fairchild basic production unit of the aircraft engine test stand, carrying 1000 lb. test load.



Jet engine wheel testing, showing quality production.



Skilled workmanship and modern automatic machine produce every complete unit to the highest standards of quality.



Case called temporary test shops for close tolerance manufacturing.



Uniform quality of material insured by modern inspection equipment and techniques.



Expanded and modernized test cells to accommodate quality output of existing power generators—Fairchild turbine engines.



Proficiency in fabrication of steel metal for Fairchild's 1000 turbine engine, combustion chambers and nozzles.



VALVE DESIGN

Over a quarter century has passed since a single engine test stand served Fairchild Engine Division, and today it has evolved into a vast engine and auxiliary powerplant design. Today, three up-to-the-minute facilities provide nearly a million square feet of floor space. This is progress in production! But, even more important, is the Fairchild creative engineering that has resulted in the latest expansion.

SOME OF THE SIGNIFICANT MILESTONES ARE:

Designing and testing of the first Cummins radial aircraft engine.

Development of the most successful aircraft, radial aircraft engine, produced in thousands for World War II military training and liaison planes.

Mass production of highly reliable, economical auxiliary generators for bombers and transports.

Volume production of turbine wheels, front and rear frame assemblies for the highly successful, reliable turbo-propellers GE J47 engines.

Applied design experience, production know-how to develop, and produce in quantity a four-cylinder 1400-hp. aircraft engine for U. S. Armed Forces target drones.

From these accomplishments and years of experience in engineering design—and in mass production of aircraft engines and powerplants—came the know-how for the development of today's jet engines, auxiliary powerplants, custom made precision built equipment for highly specialized facilities and new types of maintenance vehicles. Other projects, still "in-flight," are adding more and more power and strength to our National Defense effort.



Complete research laboratory provides facilities for testing new designs, new tools—new methods.

Minimum models of Fairchild's production equipment permit efficient planning for economical production.

TEAMWORK IN RESEARCH-DESIGN AND MANUFACTURING

Sound, creative engineering at Fairchild springs from experience. Confidence inspires teamwork and stability—provides the urge to experiment with new ideas, to test new theories, new methods and new facts. From the drafting boards come new designs for advanced powerplants and engine-vehicle combinations. In the manufacturing plant itself, experienced production specialists constantly seek better ways of producing higher quality products at minimum cost. Past performance and present assignments hint of even greater dependence upon Fairchild for the vital components of tomorrow's more complex weapon systems.



New methods, such as Fairchild's A-10 design, permit new design applications.

Fits of workmanship by experienced craftsmen allows us to compete in each country.



ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division
FAIRCHILD, LONG ISLAND, NEW YORK
FAIRCHILD • MINNEAPOLIS • WILLYS DIESEL



In
Aircraft Fan Design

Only JOY AXIVANE FANS

Offer All These
Advantages



CAST-IN STRENGTH

The outer casing, stationary vanes, and the inner casing are a single casting to provide maximum resistance to shock, and to prevent strain under working conditions.

LIGHT WEIGHT

These fans are not only compact in design, but are available in either aluminum or magnesium to reduce overall weight to a minimum.

VANEXIAL DESIGN

Stationary vanes provide an equal pressure and velocity distribution at all points across the fan outlet, thus producing an air flow pattern substantially free from turbulence.

AERODYNAMIC ENGINEERING

Both the blades and stationary vanes of Joy blowers employ aerodynamically-efficient airfoil shapes, to insure the most favorable electric-to-air power ratio.

PRECISION CONSTRUCTION

The squared-off blade-tips clear the casing by only a few thousandths of an inch to minimize tip loss, a common cause of fan inefficiency, and to reduce noise.

COMPLETE LINE

Joy offers a wide selection of standard single or two-stage aircraft fans, as well as custom-designed types, for all ventilating, heating or cooling problems on military and commercial planes. Optional features include straight or flared inlet, bonded or flanged connections, radio noise-filters, aerodynamic, and cooled motor where required.

UNMATCHED EXPERIENCE

Joy is the world's largest manufacturer of vanexial fans and blowers. Fans for all purposes, ranging from 1,500 H.P. to 10,000 H.P. and up, with fixed, adjustable, or reversible blade pitch, combine the unequalled background of JOY engineering experience. Let us work with you. • Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

JOY

WORLD'S LARGEST MANUFACTURER
OF VANEXIAL-TYPE FANS



Count on Joy Experience

Over 100 Years of Engineering Leadership



TWIN TURBINE wheels in check-up. Buckle seats are 6, but type

are 36 secondary on distributing caps, 16 on the outer edge and 16 on the outer edge.

Within the combustion chamber cover there is located a heat shield protecting the shaft between turbine and compressor. Front end of this heat shield is supported by the rear face of the center main bearing support housing. This housing also supports the front end of the rear main bearing support cover assembly which also is located within the combustion chamber heat shield.

• Vaporizing Case Heads—The vaporizing system used in the H-5 is basically different from that used in U.S. designs. Fuel is mixed by evaporation only. There is no mixing of fuel and air by mechanical atomization with spray nozzles as other engines.

Fuel passes through 36 tubes installed in the combustion chamber inlet housing. These tubes terminate inside the 36 corresponding primary air-inlet tubes, which then open, hooked and pointing upstream.

Fuel pressure in the tubes feeding



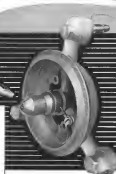
ANNUAL combustion chamber's front wall covers 36 primary fuel-inlet tubes (located between 16 secondary on distributing caps (outer case).



Nozzles for JETS

THIS IS ONE

of many Brainerd Steel nozzle assemblies for jet engines built by Ex-Cell-O Corporation, one of the world's largest producers of aircraft precision parts.



There's something of Ex-Cell-O in practically every plane made in the U.S.A. today.

Illustrated below are typical blades, nozzles, hydraulic actuating assemblies and fuel control assemblies, precision built by Ex-Cell-O Corporation to aircraft builders' rigid specifications.



EX-CELL-O CORPORATION DETROIT 32, MICH.

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT PUMP AND BLOWER DESIGNS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • BUILT TO ORDER

milled skins by
FRANKLIN BALMAR

from the
original, single
trapped slots

to today's
highly complex,
integrally stiffened
panels



Since 1946 we have been producing milled skins for the nation's leading aircraft builders. Special machines and techniques developed in our plant have enabled us to keep pace with the fabrication of present types of highly complex, integrally stiffened panels. Today we are one of the largest independent producers of milled skins serving the aviation industry.

Present facilities include 5 side mills with capacities up to 72" x 252" ... ability to be increased to an 84" x 312" capacity by additional equipment.

Let us quote on your drawings or specifications for skin milling—or write for complete data on our skin milling facilities.

Also General Machine Shop and Steel Foundry Facilities

We can also offer you complete facilities and engineering assistance for the production of metal components for aircraft products. A complete catalog illustrates and describes our facilities and services. Write for your free copy today.



**FRANKLIN BALMAR
CORPORATION**

Wadberry, Schmeers 11, Maryland

AIRCRAFT TUBING

GOVERNMENT SPECIFICATION TUBING IN STOCK

- AIRCRAFT TUBING
- ALUMINUM TUBING
- STEEL TUBING
- COPPER TUBING
- BRASS TUBING
- INCONEL TUBING
- MONEL TUBING
- TITANIUM TUBING

SERVICE STEEL - DETROIT, MICHIGAN



COMBUSTION chamber detail shows relation of primary air-fuel (vaporizer) tubes and secondary air supply

into the primary air-fuel (vaporizer) tubes is only sufficient to insure that the proper quantity of fuel will flow into the combustion chamber against the pressure inside the vaporizer tube. Ability to operate at comparatively low maximum fuel pressure makes possible good combustion efficiency at high altitude where the weight of air per second fed to the combustion chamber is relatively small and where a correspondingly low fuel flow only is required, keeping the temperature of the chamber within limits.

Primary and lighter steel combustion tubes (primary tubes) are fed part ahead of the vaporizer tube support plate. Hence, for the first few seconds before primer and main fuel tubes are in operation. The vaporizer tubes are then quickly heated by the combustion flame so that liquid fuel flowing in is vaporized on contact with the inside wall of the tube. Tube design is such that its operating temperature is sufficiently high to provide complete vaporization of the fuel without quenching and excessive erosion.

The rich mixture emerging from the tube into an area of high turbulence is thoroughly mixed with sufficient air for complete combustion in a short period of time.

► **Secondary Air—Secondary air**, entering the combustion chamber through the 56 air distributing cups, mixes with the combustion flame near the vaporizer tubes, diluting it to insure combustion stability and high-combustion efficiency.

A slot at each of the secondary air distributing cups, as well as a key in register relative to the end of the vaporizer tubes, promotes best mixing of the secondary air and flame.

Heater and inter heater of the combustion chamber are protected from overheating and hot spots by cooling air flowing through slots and holes in the heater.

► **Turbine Data—Turbine section is a**

NEED SPARE PARTS?

You can look to Canadaair as a permanent, reliable, fully authorized source for spare parts for C47/DC3 type aircraft.

Canadaair has in stock thousands of components, assemblies, shaft parts, accessories, hardware and vendor items; and requirements that cannot be filled from stock are being manufactured in latest specifications.

Servicing over 160 airlines in 45 different countries, Canadaair has among its clientele the world's foremost aircraft operators.

It will pay you to deal with Canadaair — an established Company with a world-wide reputation for dependable maintenance.

A subsidiary of
CANADIAN TRANSIT CORPORATION
New York 17 • Washington 25



CANADAIR

—AIRCRAFT MANUFACTURERS—
LIMITED—MONTREAL, CANADA

two-stage unit. First-stage stator blades are bolted to a stator inlet ring and second-stage stator blade support. Tips are held in a blade-support ring. This support ring is bolted to the rear end of the first-stage stator blade support assembly, which is attached to the rear flange of the rear main bearing support case.

Second-stage stator blades are clamped to blade-encasing ring to form sections which are bolted to the second-stage stator blade support and the second-stage rotor blade support. Each row of stators are 300 blades.

First-stage turbine has 110 blades, second stage has 75 blades. Blades

are held to the turbine disks by fit into roots and lock plates. Second stage turbine rotor disk is coupled to the first-stage disk with taper pins.

First-stage turbine rotor disk is coupled to the turbine rotor rear shaft with taper pins. Front end of the turbine rotor rear shaft is splined to the turbine rotor shaft coupling. Bolted to this coupling is the turbine rotor front shaft, and bolted to the front end of the latter is the compressor rotor shaft drive coupling.

Inner cone of the exhaust section is supported by four titanium tubes, closed in axial bearing, arranged at 90 deg. to each other. These tubes and

flanges are supported by the rotor exhaust cone.

The tubes allow rotor cone to expand or contract radially and move in the fore and aft direction, to a limited extent, with respect to the outer exhaust cone.

Bearing, Turbine Cooling—Bearing cooling is done with air bled from the fifth stage of the compressor. Air passes through external lines from the rear pressure section to the center main bearing support housing and through internal lines from that point to the center and rear main bearing. It goes around the bearing, meets the oil coming out of the bearing where it is forced into an oil seal. It is then discharged from vapor manifolds on the center main bearing support housing and dumped overhead.

Turbine cooling is by air passing through from the space around the combustion chamber inlet and outer liner.

An oil seal is bolted from the eighth compressor stage through holes in the compressor rotor shaft to the axle of the compressor and turbine shaft. It goes out through holes in the turbine shaft between the first and second stage turbine disk and out through the end of the turbine shaft.

Three oil bleeds are located on the center bearing support housing to take lubricating stage air for rotor preheating and other engine uses.

Oil Scheme—Diagram of tank is mounted near the top of the compressor housing and is supplied as an integral part of the engine. The feature simplifies development and installation problems associated with a variable oil supply system.

Oil from the tank is delivered through an external line to the oil pump, mounted on the lower left side of the front main bearing support. There is one gear-type pressure pump, a gas-type scavenging pump, and two piston-type oil metering pumps. Pump drive is by beveling gears in the accessories drive power take-off bearing, located in the front main bearing support.

Oil pump discharge passes through strut No. 3 and is splined into the scavenging pump shaft. An intermediate gear on the scavenging pump shaft drives a crankshaft gear which, in turn, drives the pressure pump gear. The crankshaft actuates the piston-type oil metering pumps.

While the center and rear bearings have a total loss oil system, a circulating system is used for front bearings.

Fuel Highlights—In the fuel system, the booster pump is an engine-driven unit consisting of a centrifugal supply pump on an integral shaft with a turbine-type pump. An adjustable relief

CASTINGS

by ALCOA!



Over one-fourth of all the aluminum produced ends up in cast form. It's no effort to build the tremendous demand for products made from these metals. Alcoa operates five modern casting plants. In Vernon, California and Bridgeport, Connecticut and Cleveland, Detroit and Buffalo, Alcoa makes castings of every type—mud, die, permanent mold, and plaster—both in aluminum and in magnesium.

If casting response is a problem in your plant, then you should know of Alcoa's recent advances in casting processes. We make mold castings with walls 1/16" thin, and we hold tolerances to 1/16". The permanent-mold process, once limited to small parts, now includes 800-lb bearing and 250-lb pistons. Our plaster castings are competitive with die castings and are held to .001-in. and .002-in. One plant is producing die castings as strong as, and in finished form, less expensive than, equivalent parts in cast steel.

Chances are you haven't taken the time lately to find out exactly what your casting cost was. We don't mind the money price—we want the price as finished and assembled. As a part of the Alcoa team which has helped many other companies slash the number of casting rejects, we offer this suggestion: Scrapped casting costs are worth a look-see in your plant, and the time to help you do this is your Alcoa sales engineer. ALUMINUM COMPANY OF AMERICA, 1800-F Alcoa Building, Pittsburgh 13, Pennsylvania.

ALCOA
ALUMINUM

ALUMINUM COMPANY OF AMERICA



Westinghouse Air Brake Company's Decelostat Controller features accurate safety with either handbrake or air brake. Control's improved weight and 27.5 lbs.

No Skids ON CONVAIR 340's WITH WESTINGHOUSE DECELOSTAT™ CONTROLLERS

• To prevent tire skidding during braking and to improve safety on short haulways, Westinghouse Air Brake, Inc. is equipping its entire line of Convaire 340's with Westinghouse Decelostat™ Controller Equipment.

Decelostat's Convaire controller wheel skids before a wheel locks, they automatically return the brake for an instant then quickly reapply the brake when the skid stops or even. Decelostat's unique side linkage in any weather, in the constant possible braking distance.

Write for complete information

**Westinghouse Air Brake
COMPANY**

HEAVY TRUCKS DIVISION



WILMINGTON, PENNSYLVANIA

AIR BRAKE SECTION

Westinghouse Air Brake Company, Inc. is a subsidiary of Westinghouse Electric Corporation, All rights reserved. All trademarks are the property of their respective owners.

Patent Office: Copyright, all rights reserved throughout the United States. See page 27 of the Decelostat Controller in Series by Westinghouse Electric Co., Ltd., London, England.

U.S. NAVY SETS A NEW WORLD'S RECORD

with,

**WRIGHT
CYCLONE 7's
and
CURTISS ELECTRIC
PROPELLERS
in a GOODYEAR ZPG-2 Blimp**

**200.2 hours aloft
without refueling!**

Remaining aloft and cruising steadily for well over a week, a U.S. Navy blimp ZPG-2 — with a Curtiss-Wright engine-propeller "power team" — has set a new world's record of 200.2 hours for a nonmilitary blimp of aircraft and crew without refueling.

The Navy's fleet of NAN type non-rigid blimps, largest in the world, designed for long duration defense patrol, are each powered by two 900 h.p. Wright Cyclone 7 engines, housed within the car. On outgassing, and driven by the vapors through a special transmission system, the two 16" 7" Curtiss Electric Propellers with hollow steel blades. The inherent features of the Electric Propeller make it completely controllable through all stages of pitch from feather through the forward operating angle to hover and reverse pitch. During prolonged patrols with this unique installation it is possible to use both engines for full power or to use either engine alone to drive both propellers for economical search operations. Like this record-setting ZPG-2, all U.S. Navy light-inflatable craft in service are equipped with Curtiss Electric Propellers.

CURTISS-WRIGHT

CORPORATION • WOODBRIDGE, N. J.



JOB'S FOR ENGINEERS • TECHNICIANS

Boeing Opens Giant Flight Test Facility

New Seattle establishment uses latest ideas to speed collection and analysis of data on high-speed jet and turboprop aircraft.

By William J. Conklin



FLIGHT TEST meeting is called by chief, "Tex" Johnston (head of table)



CONTROL ROOM of new flight test complex looks down on first production B-52's.

Seattle—An expanded flight test program on new jet and turboprop planes that will be one of the largest in the history of the industry opens at Boeing Aircraft Co. today operations at a 55 million facility here. The setup is one of the largest and most modern in the nation.

In addition to its present eight jet B-52 Stratofortresses and the new four-jet 707 Stratoliner-Stratocruiser transport, Boeing will be testing turboprop versions of the C-97 Stratofreighter and B-47 Stratojet. Experimental flight tests will be operating more than 20 models of different types.

The flight test program will be based in a vast building whose expansive interior can house five of the giant B-52's. Test Pilot in Charge—At the head of the operation will be test pilot A.M. (Tex) Johnston, wearing an uplink light against one company official's prediction that "Tex is going to spend more time here than a drink here."

Johnston, who favors cowboy boots and a swing tie, looks more comfortable in a B-52 cockpit than he does behind a desk. But appearances can deceive.

A few weeks after Johnston took over his new post as chief of flight test last September, he negotiated the entire division, shifting to a project-type organization and dividing the flight test



LARGEST UNOCCUPIED DOWNTOWN in country is shown here for 700-ft. part of new Boeing flight test hangar at Seattle.



with a
**constant-speed
AIRLINER
MET-L-MATIC
propeller by
MCCAULEY**

The Met-L-Matic propeller is unique in its class particularly because of its design details, which greatly reduce maintenance costs. Only the Met-L-Matic propeller features a separator which permits the bulk of the propeller blades to be removed against one another. Bearing failures due to chafing and galling are eliminated and bearing friction is greatly reduced. As a result, the prop change is smooth and easy to do. And the propeller's efficient air flowing mechanism for smooth air flow must come out of this separator in the Met-L-Matic.

**Check
these
features:**

- Insulated-in, factory lubed, sealed, airfoil shape propeller mechanism
- No photo-lubricating paint required in weather.
- Hydraulically operated, fully HMA operating without need for pumping
- Actual aluminum alloy hub and bolts for high strength-low weight

• Two fly with CONFIDENCE behind a Met-L-Matic propeller.
See Sales for 1000's more engines. See them in our brochure, *Met-L-Matic*.



MCCAULEY

INDUSTRIAL DIVISION
1400 BROADWAY
EASTON, PA. 18040

"Met-L-Matic is the most advanced metal propeller for general and business aircraft — today's, and the future. It's simple, and easy to use. Met-L-Matic."



DEVELOPMENT ENGINEERS

FOR: Design Engineering, Practical Research,
Investigation of Theories, Personnel Analysis

As interesting challenges for senior design engineers to work directly with the project engineers helping through the prototype stage new developments in:

- Aeronautics Control Instruments
- Electronic Navigation Aids
- Aircraft Engines
- Airframe Assembly
- Airframe Assembly
- Aircraft Engines

For these jobs you are interested in, we have two or more years experience in electro-mechanical, work done in the above fields or in many other superior achievement records in physics, electronics, electrical or mechanical engineering.

YOU'LL LIKE WORKING AT FORD INSTRUMENT

- High pay, large, and new work
- Stable but progressive company
- H. T. C. System with all the advanced
- well-developed opportunities
- Airplane design helps benefit
- Perfect Plan
- New Ford Methods
- New Work methods with pay
- Future assistance for further related
- studies

Our policy of permanency of position and continuity of service does not allow us to employ engineers unless there is a clear and definite need for your projected plans into the future. And we require that you plan it for you into reality. We are not in contact by mail or by H. T. C. plane.

Mr. P. J. McCauley, Industrial Division, Extension 416

FORD INSTRUMENT COMPANY

Division of the Ford Corporation

31-10 Thomson Ave., Longmeadow, N. Y. 12010 (located from the town of New York City)

motion into five major groups: Production Flight Test, Experimental Flight Test, Pilotage, Operations, Instrumentation, and Supporting Services.

The duties of Production Flight Test and Experimental Flight Test are conventional. Operations maintains test records, documents data requirements, handles data transcription and prepares reports. Instrumentation does research and development in its field and is responsible for installation of those devices in experimental aircraft.

Supporting Services supplies clerical and administrative help, handles radio facilities and is responsible for such things as crew training and equipment and the taskmaster.

Further, Experimentation—Douglas's experimental flight test section will soon have double in size in the next year and a half, to almost 600 employees.

"These people will be handling the largest load in flight test operations, but we've been called on to handle," says Johnson. "We had to seek out different methods of operation, then involving and transcription to meet the workload, or we would have had no data coming out our ears."

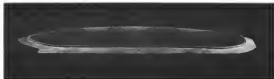
The shift to a project-type organization was made last December when Johnson advised by staff. "An equal size program of this magnitude with the present organization would lead to serious overloading of supervisory personnel and result in serious inefficiency. To correct this condition it is necessary to separate certain units, combine compatible services, clearly define responsibilities and establish unity in direction."

The project setup, he pointed out, means efficiency by clearly defining responsibilities and establishing definite channels for coordination with project and staff units.

Each project now has a project pilot, test operations engineers and ground operations engineers. It is the responsibility of the project test operations engineers to plan test flights and handle data analysis after flights. The ground engineers keep the test aircraft flying. Dougal's engineering pilots usually handle two projects, but some operate one project pilot full time.

"This is an age of specialization," says H. A. Ricks, Johnson's assistant, test assistant and right hand man. "We are specialists in flight testing. It is a slightly different walk of life from that of the maintenance or repair plant man. We know how to evaluate an airplane as an operational object. We are not experts in powerplant, aerodynamics and so on—we need support from people who are experts in those fields—but we know how to test those parts, know what weaknesses to look for."

► Glenn Hanger—Headquarters for the



**How side panels of full-tempered,
bent Flexseal Duplate are used
in the Douglas F4D-1 Skyray**



A tribute to American technology, the Douglas F4D-1 Skyray has brought the official speed record back to the United States from Great Britain.

The side panels of the aircraft's all glass canopy are large—over a compound bend, and—they are made to order by Pittsburgh Plate Glass Company.

The new Navy jet interceptor's side panels are metal-cast Flexseal Duplate made by two pieces of 1/4" thick full-tempered polished plate glass and a 138" vinyl filler. The over all thickness of each panel is 3/4" ± 1/16" maximum.

Each side panel has an overall size of 36" x 36" with a radii of bend varying between 24" and 180"—depth of bend is 2 1/4" maximum.

Pittsburgh Plate Glass Company makes a wide range of special purpose glasses for aircraft glazing. And a Pittsburgh Technical Representative will welcome the opportunity to work with you on your next design problem.

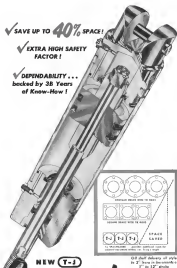
For more detailed information, write Pittsburgh Plate Glass Company, Room 4273, 632 Fort Duquesne Boulevard, Pittsburgh 22, Pa.



PAINTS • GLASS • CHEMICALS • BRICKS • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED



NEW T-J Spacemaker AIR CYLINDERS

Streamlined design of the new T-J Spacemaker allows us to rely on up to 40% in mounting space! It's performance proved... super rugged with more high velocity factor... solid steel barrels... heavy wall, precision bored, hard chrome plated, stainless steel body. Integral cylinder head to body construction... heavy duty, 16 screws, hard chrome plated gasket rod.

Available with the new T-J Super Custom Flexible Bore which allows positive carbon with automatic valve action for fast return stroke. Many standard sizes and styles... for pumping, pulling, lifting, clamping or control valve T-J dependability. Write for Bulletin 414 The Tomkins-Johnson Co., Jackson, Mich.



TOMKINS-JOHNSON
DESIGNED FOR OUR AIRCRAFT ENGINEERS, OFFICIAL LICENSEE

pilot, engineering staff, planes and laboratories will be a building where Strathmore can roll in and out through the largest vehicular door way in the U.S., 700 ft. long and 65 ft. high. Its 15 vertical lift doors open from the flight apron into the air.

To support the weight of the doors when they swing up and out, the entire roof is reinforced like a bridge across a river. Roof support comes from two columns within the structure, each capable of bearing more than 5 million lb. weight. Roof trusses are bolted down to anchor points in the area of the building by steel tension columns.

But it is not only size which makes the new flight test hangar unique. Its facilities are specially planned for maximum efficiency in flight testing.

The need for this is apparent from Rock's remark: "A single full flight of a B-52 may have 1.5 million data points." To record, transmit and analyze these is a major operation.

There is very little waste motion in a B-52 test flight. On each flight, 85% of the time the aircraft is in the air as utilized for actual flight testing. Even during the flight information is being transmitted to Boeing technicians on the ground.

Communications. Vital—As space for crew members is reduced on high speed combat aircraft such as the B-52, transmitting and radio communications take on an increased importance in flight testing. And as speeds increase, more powerful radio transmission and receivers are needed to find the aircraft from the frequent turns which otherwise would be necessary to stay within radio range of ground engineers.

Close to \$100,000 has been spent on the radio facility which will surround the communications. Perched high on the roof of the new hangar is the control tower for Boeing flight test. Through its tilted observation windows the tower operators can view the aircraft flight apron and receive on test with test results in the air. There is also a magnificent wind-sheathed view of the entire Seattle area.

It's a rugged climb up a narrow stairway to reach this "island in the sky"—once seven stories above the ground. Complete living facilities are provided for the men on duty including a hot plate for preparing meals. A 14-seated control console is fitted into the front of the glass enclosure. Two low riders in the control hold screens and a self-panel for connection to the console and to radio room in the ground floor of the building. There also is a direct connection to Rex Johnson's office so the chief of flight test can follow aircraft in the air without leaving his desk.

An "unknown item" is operating on the flat roof of the hangar, there will



AMERICAN LATEX' NEW STAFOAM

From a liquid — poured in place. Strength to stir up a roaring tornado (see next page)

Stafoam-Strengthened Blades Lash a Roaring Tornado Through Boeing Wind Tunnel

The world's largest privately owned wind tunnel uses Styrofoam to give its fan blades the strength to kick-up a typhoon gale. The tunnel is a part of the Boeing Airplane Company's Edmund T. Allen Memorial Aeronautical Laboratories in Seattle. The strengthening material of the fan blades is Styrofoam, the name applied to all foamed-in-place plastics manufactured by American Islar. Products Company.

These Staufon-strengthened blades will help engineers and scientists gather data in the trans- and super-sonic flight regime. They must be strong enough to withstand the stress and strain exerted on them by air ions producing up to 54,000 horsepower; they must be light enough to serve as fan blades and they must be able to resist the heat generated in the operation of a transonic wind tunnel. Besides having the necessary thermal characteristics and the most favorable weight/strength ratio, these Staufon-strengthened blades save countless hours of manual fabricating time. Staufon is simply poured into the hollow fiberglass blades and in minutes it chemically forms into place, completely filling the cavity and bonding the blade into one, super-strong, light weight unit.

Efficient, Fast, Simple

Models for Boeing giant wind tunnel were made by Boeing Aerospace Company in Seattle, Goodspeed Aircraft Corporation in Phoenix, and Raymond DeLoe & Engineering Company in Los Angeles. Here we see the simple process of joining SeaForm at Raymond and Boeing. Filling cavities with rigid Alkyl STAForm does away with the necessity for cutting and shaping a core and then painstakingly fitting other structural members around the core material. The parts and brags needed for such fabrication are also eliminated, together with the blueprint and engineering involved. Quickly raised workarea can pour liquid into the cavity which is to be strengthened. STAForm sets into a strong, lightweight core that binds the two into one integral part.



Putang, William George, M.D.
see Freeman, W.



Mitigation strategies



Page 19 of 20



Featuring a firing coat for use of the
gun blades.

Transverse the Coraco-clavicular joint.

Each square cell is 1 cm. wide. Arrows are

Shatter Resistant



Cross sections through STAFORM filled
alloys showing fissures and lack of cross-
hatching near holes made by 50 caliber machine
gun shells.

Electrical Adaptability



Stibium is highly adaptable for soldering, brazing, and joining components and other electronic devices as shown above. Stibium pins should be pre-cut and banded in place.

NOTE

Because of space limitations in this ad, information is necessarily edited into SAMPAM's supplied on-line, ready-to-use material. In this ad, features such as single translation and shared character sets are more general in description so that a truly complete, hands-on play of SAMPAM has not been played.

**Stofoam's Astounding Variety of Properties and Uses
Foretell Countless Potential Applications**

Sulfonam's applications are so varied, and the results obtained in extreme conditions are so gratifying, that it will revolutionize many manufacturing methods. Cell size and uniformity of cell distribution can be closely controlled—varying from a nearly spherical structure to cells of $1\frac{1}{2}$ inch diameter. Formulations controlling weight, strength, density, and texture can be prepared at will. This almost limitless range of controllable properties means that Sulfonam can be formulated to meet specific engineering problems. Sulfonam may be the unsung hero in many of your most critical problems.

Physical Test Values at 70°F

Field applied parallel to direction of beam use



Figures 1 and 2 show the Gaussian histograms of observed values in minutes of each



The small sample and the large sample weigh the same, further complementing wide range of abilities possible in *Strophomena*.



²Registered Trademark of American Laces Products Corp., is manufactured under "LOCKHEED" patents owned by Lockheed Aircraft Corp., Burbank, Calif.

American Lateral Products CORPORATION
2341 West El Segundo Boulevard • Hawthorne, California

MEET CAMAIR

—SERVING THE COMMERCIAL AND MILITARY NEEDS OF AMERICA'S AVIATION FROM GALVESTON, TEXAS

FEATURING—OVERHAUL—REPAIR—MODIFICATION—MAINTENANCE—AND CONVERSION OF AIRCRAFT

PRODUCTION OF AIRCRAFT PARTS, ASSEMBLIES, TOOLS, DIES, JGS, AND FIXTURES WITH AIRCRAFT QUALITY STEEL FORGING A SPECIALTY

—AND PROUDLY PRESENTING OUR CAMARE "AEC", A SUPERIOR TWIN ENGINE CONVERSION OF THE FAMOUS HAVON

Aviation
CAMAIR
Aviation Development & Manufacturing

AIRCRAFT AIRPORT — GALVESTON, TEXAS

A DIVISION OF **Cameron** HIGH WEARS, INC.

be between 40 and 50 seconds up here in less than a second.

► **Transmitter Installation**—Transmitters are installed in small rooms hung under the ceiling of the hangar. They are reached by narrow catwalks 75 ft in the air. Lines up here—more than five thousand in the air—people on the floor of the hangar decide to transmit. A B-29 becomes inoperative from this height. Only the B-42 refuse to climb. They still look large.

If it is up here as the others that you can best see the heavy steel work which has gone into the building, the concrete beams and steel bolts. The special transmitter rooms are located under the roof to cut down the length of lead wires to the roof top antenna. Location of the transmitter on the ground would cut power to the antenna in such as 50% in some cases, according to Kenneth Wenzlow, group engineer in charge of radio facilities.

To reduce the fire hazard, a special carbon-dioxide fire extinguishing system protects each of the transmitter rooms. As in the tower shell, use of wood is held to a minimum to reduce the danger of fire. Despite the weight, the floors of the transmitter rooms are of concrete. When that goes a man's thought runs down to earth for grounding.

► **Data Reception**—Transmission and reception are linked to three windowless soundproof rooms and teleconferencing rooms in the long rectangular shop and office building at the rear of the hangar. From here, engineers can keep in touch with test aircraft during flight. They can watch the radar lines on charts passing from the teleconferencing room. Each transmitting information from remote points on the aircraft to accurate look safety and efficiency of men flying in aircraft many miles away.

It starts getting hot down at some point in the process. They can mean the pilot by radio before he himself is aware of it. If information can be received electronically, it can be transmitted to the teleconferencing machine from receiving devices on the aircraft.

► **Data Processing**—Down the hall is a soundproof room is the section which does one of the toughest jobs of all, the Data Processing Group. The object of flight testing, B-42 points out, is to witness data—data which is of no value unless it is in usable form. The information from hundreds of thousands of data points must be correlated and analyzed. Techniques of data reduction therefore are becoming increased emphasis in the B-42 flight test division.

Electronic methods are used to reduce data to a read system which can be fed to the company's million dollar calculator. Here, some of the complex equipment developed by Teleconferencing Corp. of Burbank, Calif., is used by B-42 to provide its human talent

Bomarc Missile Flight Analyzer



INTERMEDIATE TRANSMITTER In data identified down from flight of the Bomarc missile has been developed by Boeing, Ingalls Co. to solve problem of connecting original magnetic tape recordings into some which punch some sort of punch. Machine cannot keep up with magnetic tape played back at original recording speed and tape cannot be slowed down without loss of signal.



VISIBLE TAPE RECORDING, using electric needles which indicate motion of record recording paper in order from magnetic tape and then run through a data converter (shown) at a sufficiently slow speed to feed punch card perforator.



600 MAN-HOURS LATER, five days after the missile flight, 7,200 ft. of magnetic tape has been converted into punch cards which then feed a plotting machine. A plotted picture of the missile's flight. An array in 1,600 glyphs, each 5 ft. long, together with movies, still photos, and oscillograms must then be analyzed.

TOMORROW'S AIRCRAFT: *One step closer*



**Westinghouse Turbojets
explore extreme speeds and altitudes
...in X-3 research jet**

Pushing further into the realm of supersonic flight, two J34 turbojets with afterburners are pioneering the use of jet power plants for sustained, high-speed flight.

J34 axial-flow turbojets were chosen to power the X-3 because of important features such as small engine diameter and high thrust-to-weight ratios which permitted the use of two engines to provide excellent high-speed performance combined with multi-engine reliability.

Westinghouse experience and technology are directed at the successful conquest of aviation frontiers. Continuing advancements merit your attention so neither what the aerodynamic design of weapons systems application might be. Let Westinghouse help you bring tomorrow's aircraft... One Step Closer. Westinghouse Electric Corporation, 1 Gateway Center, P. O. Box 561, Pittsburgh 30, Pa. A-1001

Jet Propulsion • Airborne Electronics • Aircraft Electrical
Systems and Motors • Wind Tunnels to Florida

YOU CAN BE SURE...if it's

Westinghouse



New Opportunities FOR RESEARCH ENGINEERS

Fast-growing Stratos is developing new air-conditioning systems, gas-turbine drives, controls and other pneumatic accessories for aircraft and industry. Positions are now being filled for inventors and studies in pneumatic refrigeration and very high speed pump turbines.



Write to R. T. Burton, authoring new qualifications for these interesting and challenging positions. Your correspondence will be kept in complete confidence, of course.



Wonderful recreational facilities. Fast location—Fishing, Boating, Golfing. Excellent housing available in area. Commuting to New York City.



STRATOS
A Division of Republic Aircraft & Engine Division

SAF (DGE), L. E. N. Y.

Manufacturers of air-conditioning equipment and pneumatic accessories for high speed aircraft.

with an driveline. The process, say, equipment consists of a motor, calibrator, Gaslow, modified typewriter and teleprinter.

It can do in a day the job it would take six weeks to do, processing better than 2,000 data points in an eight-hour day.

Down the side of the room is a line of small enclosed booths—each like a tiny house—which are used for making data tapes. The photo overhead.

► **8-12 Testers**—In an adjoining room are the engineers who depend heavily upon the data for their planning, the 8-12 project group. At one end of the room hangs the board outlining the flight test schedule for the YB-53.

Here, in effect, you can see both the beginning and the end of the data path, and the reduction processes. When the YB-53 takes to the air for its flight tests scheduled on the board, it will check data already analyzed while at the same time providing new data for project engineers. A computer reduces these data into what you call "trended."

"We already know more about the B-53 in less than two years of flight testing than we have ever known about any other airplane in that length of time," says Johnston, casually.

In flight testing, we merely the rise of the B-53, each hour of flight is a computer. Each test result is the main room. What does a B-53 crew do on a test flight? The board's official mark says slow tests scheduled to check speed, thermal stability, MA2, altitude, K14 bombing system, stability characteristics, canopy calibration, bomb release, bomb drop, fuel vents, engine, gear, and wheel well doors.

► **Instrumentation**—What might be called the nerve center of the flight test section is the instrumentation lab. Instrumentation for test aircraft is plus and well in advance. The first B-53, which the flight test section receives, for example, will have all the "plumb line" and wire runs installed for its instrumentation. It will take approximately three weeks to connect the instruments themselves and then the Stratosform can be submersed in its test program.

The new instrument lab is designed to serve both the calibration group and the equipment maintenance group, as well as providing an area for development work.

► **Lab Highlights**—George Hines, engineer in charge of the lab section, says you can get some of the features of the carefully planned lab.

► **Brake power** supplied to bench test units of 25-hp d.c. with 100-amp capacity, 400-cycle at 110v, and 20-hp, three phase and single phase.

► **Compressed air** and vacuum line to all bench locations, with outlets at

each workbench on each bench is the air line.

► **Transfer cable setup** by which up to 10 pairs of lines can be patched to any bench location.

► **Special power punch** for the maintenance section which have voltage and current measuring instruments right on the bench punch.

► **Shielded room** for interference-free testing.

► **Environmental test chamber** built by the Boeing Technical Refrigeration Division of Boeing, Inc., which will have an indirect test range of -100 to 100°F. Its 16-cu ft capacity can test elements to 140,000 ft.

► **Load test machine** with a 20,000-lb capacity. This was built by the Tinsley-Glen Testing Machine Co.

The new building also includes an up-to-date photo lab, which will handle colorphoto processing as well as regular processing of flight test film and photos. This group also is faced with solving such problems as camera lagging and shooting in changes from heat to cold or versus altitude.

► **Static Test**—B-53 static testing already has begun in the massive static test framework at one end of the hangar. Some 114 tons of 12-in. steel channel members and nearly 10 tons of reinforcing steel are embedded in a concrete slab more than two feet thick. Flight test does not operate the static test structure but leads support on data computing and other services.

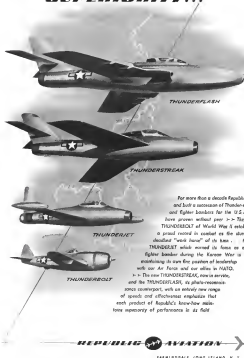
Completion of the modern facility has not stifled the familiar complaint of flight test divisions everywhere: "You know," said Kiehl two weeks before the hangar raised its new hangar, "it is already cramped for space."



Stitches Metal

First Aircraft Co. is using metal stitching machines to join flat strips to aluminum bulk plates and all other parts, rather than to aluminum bonding putty and rubber patches in storing post offices. This has increased production capability at each modern 4000 and speed monthly operations, says Arthur Reed Co., Chicago, Ill., maker of the machine.

SUPERIORITY...



For more than a decade Republic has designed and built a succession of Thunder-craft fighters and fighter bombers for the U.S.A.F. which have proven without peer. ► The mighty THUNDERBOLT of World War II established a proud record in combat as the sturdiest, deadliest "work horse" of its time. ► The THUNDERJET which earned its fame as a fighter bomber during the Korean War is establishing its own fine position of leadership with our Air Force and our allies in NATO. ► The new THUNDERSTREAK, now in service, and the THUNDERFLASH, its photo-reconnaissance counterpart, with an entirely new range of speeds and effectiveness emphasize that each product of Republic's know-how maintains superiority of performance in its field.

REPUBLIC AVIATION

FARMINGDALE LONG ISLAND N. Y.

Builder of the Incomparable THUNDER-CRAFT

Executive Peter Sims standing by the Grumman Wildcat he flew for the Hubs Estate



Gulf Aviation Gasoline
It's "refined-olene," because Gulf Aviation Gasoline is premium equipment designed with advanced Mercenol Filcon.



GULF OIL CORPORATION
+
GULF REFINING COMPANY

Ask the men with the
most experience... ask

S. ELLSWORTH SIMS

Executive Pilot
Estate of William G. Hubs
New Orleans, Louisiana

"Because an aircraft pilot relies so heavily on petroleum products, he's apt to become pretty brand conscious. Naturally, his favorite products are those which, year in, year out, serve him best.

"With me, that brand is Gulf. Twenty-three years of flying experience and more than 9,000 flight hours have convinced me that you can't use a better line of aviation products. Where available, I use both Gulf fuel and Gulf lubricants exclusively."

Gulf Aircraft Engine Oil, Series-B

For radial engines, or when a detergent oil is not desired. Approved by Pratt and Whitney and other radial engine manufacturers for all type of service. Retards sludge and carbon formation and retains its body at high operating temperatures.

Gulftide Aviation Oil, Series-D

For horizontally opposed and Ranger inline engines. Maintains ring and valve sticking, oil consumption, oil burn, sludging and plug fouling. Users of this great detergent oil have actually increased periods between engine overhauls by as much as 100%.

FINANCIAL

Airline Long-Term Debt

Company	Interest Rate	Maturity	Outstanding Dec. 31, 1959	Current Market Quotation
American	4 1/2%	June 1, 1964	\$42,000,000	101 1/2
Boeing	4 1/2%	May 1, 1962	2,000,000	101
Capital	7 1/2%	June 1, 1960	1,100,000	101
Delta	4 1/2%	June 1, 1964	10,000,000	100 1/2
Eastern	4 1/2%	June 1, 1964	10,000,000	100 1/2
United	7 1/2%	Feb. 1, 1961	10,000,000	100 1/2

NOTES: 1. All rates are 100%.

2. All maturities are 100%.

3. Figures are based on current market quotations.

4. All figures are in millions.

Trunks' Senior Debt Credit Is High

Standing of airlines' long-term obligations is on par with those of prime industrial and utility securities.

Almost unnoticed amidst the fuss and confusion of the air transport industry is the high credit standing now being accorded long-term debt of the trunk airlines. With but one exception, this debt commands a price as a par with that of prime corporate and public utility securities.

That this present high state of trunk airline long-term credit was not always so becomes evident from a review of each of these airline trunks. Excluding bank credit, which are primarily in trouble for relatively short-term periods and have different characteristics, the trunk airlines have long-term obligations outstanding with the public or institutional investors.

AA's Experience—American Airlines has the largest senior debt outstanding and carries the lowest interest rate of the group. Its financing represents what ranks excellent timing and recent market recovery sponsorship of high class assets in a rising market.

In the summer of 1946, an ancient master building group headed by Kildes, Peabody & Co. injected an amount of \$10 million in 10% debentures and \$45 million in 3 1/2% preferred stock. At about that time the market for this type of securities, particularly of the airline, began to deteriorate. Never before, but now of the American offering was sold, although at some price concession which meant losses to the underwriters. The airline, however, received the full amount of the underwriting commitment. No airline debt in equity securities have been sold since on such favorable terms.

Profitable Reapportioning—Reflecting the deteriorating balance of the airline industry in general and American in particular, the company's debentures sold at a low in 67 a few years after their offering. A gradual price recovery was made as earnings improved.

In an acute move by the management, some \$30 million principal amount of these debentures was recovered as the open market during 1949 and 1950 at a price believed to average around 96. In addition to acquiring these bonds at a discount, American negotiated all sinking fund payments for all years up to June 3, 1958. In other words, the company has until mid-1958 to meet the annual requirement of sinking \$500,000 at bonds. For subsequent years, these requirements drop to \$1,100,000 annually.

Most of these outstanding debentures are believed to appear in the portfolios of large institutional investors, making for a small floating supply in the hands of the general public. This means that under prevailing circumstances any future debenture offerings may be sold, notwithstanding slight premium as compared to present quotations of around 96 1/2.

Mid-Continent—East—The only air line long-term debt selling at a non-sustainable discount is that of the Mid-Continent 4 1/2% convertible debentures issued by Bonair.

The issue was originally sold by Mid-Continent in May 1951 in the amount of \$2 million. A conversion feature was added to "insure" its acceptance among investors. When Bonair acquired

Mid-Continent it also assumed this obligation. Present quotations of around 83 in these debentures reflect the current weakened position of Bonair.

Capital Debentures—Capital Airline's long-term debt stems from the issue financing sponsored by its first investment in September 1948. At that time, a total of \$10 million in 3 1/2% convertible debentures was sold. Having most attributes of a convertible preferred (which observers maintained should have been sold instead) these debentures are entitled to have various restrictions which were in place in later years to enable financing management without affording the holder any real protection.

A recapitalization was issued recently and accelerated in November 1949. As a result, the debenture holders were offered an exchange of new Series A and B 4 1/2% debentures in equal amounts. Only the Series B were convertible. Even so, in that time, previous statements had indicated the old 3 1/2% were to be \$7,385,000. Of this total, \$5,000,000 elected the exchange offer. This created \$2,385,000 principal amount of each of the Series A and B in \$1,192,500 of the original 4 1/2% note. The Series B note was called for redemption on May 15, 1951.

Converting down to Apr. 15, 1954, it is noted that this original \$11,925,000 long-term debt early \$2,710,000 was outstanding. This consisted of \$700,000 in the newer Series B debenture and \$11,015,000 of the old 3 1/2%. A strong sinking fund requirement of \$1,000,000 was also usually met by sinking in cutting down this debt. It is noteworthy that the operation of this sinking fund should completely extinguish this particular debt by 1958—well in advance of the scheduled maturity. It is interesting that the Capital Series B issue sold at a premium shortly after the old 3 1/2% note. Back in 1946 and 1947 the original 3 1/2% had low values when conditions were in the low 70s.

The accumulation of credit is a reflection of the successful rehabilitation of a debt property by present management.

In fact, this reduction in long-term debt is even more significant in that it has been accomplished while equity values have been sharply appreciated without substituting other forms of debt. For example, at Dec. 31, 1959, the company showed a net worth deficit of \$754,457. At Dec. 31, 1957, it could report a healthy net worth position of \$1,017,123. Total debt of all issues aggregated \$11,550,000 at the 1957 close. At the close of 1959, total debt declined to just \$4,385,000. The company now has the lowest debt-to-capital ratio of any airline airline.

Trans-World Express—TWA, under the leadership of Ralph S. Demaree,

If Your
Government
Contract...

...or Your
Regular Product

Requires
MANUALS

Call in the
McGraw-Hill
Technical
Writing
Service

- OPERATION
- SERVICE
- OVERHAUL
- PARTS CATALOG
- TRAINING

Whether you send one or a lot of manuals written and checked precisely to meet Government specifications or whether your products are such that instructions on their proper installation, operation, and service must be provided—Technical Writing Service can do the job for you efficiently, accurately, and economically. Technical knowledge and writing skill are the backbone of our service.

Write or Phone

TECHNICAL WRITING SERVICE
McGraw-Hill Book Company, Inc.
323 West 42nd Street
New York 36, New York

Tel. 669-6900

has achieved a considerable measure which is reflected in the company's national credit position. The \$200-million 1940 mortgage company loan funded upon the merger in 1945 1946 (without adequate equity support) placed the company in a series of financial straits, the effects of which are still noticeable. At one point, the insurance company was directed by the controller in violation of Securities National Act of Congress, to carry the loss on its books at 50 cents on the dollar.

Today, because of the strenuous efforts of management in buying TWA along, which made consolidation in a strong backdrop of the equity, the same valuation agency has priced this debt at par, or 100.

Only recently TWA made another \$1-million sinking bond payment, as during the insurance company loan down to \$45,840,000 as of May 12, 1954. The bulk of this outstanding loan is scheduled to mature in June 1, 1955. In view of TWA's projected capital expenditures along with other industries during the next few years, a scheduling spectrum of its debt structure is clearly indicated. As of Dec. 31, 1953, other debt amounted to more than \$235 million. However, this should present no unreasonable problem.

United's Debt-Crushed Air Lines' long-term debt is held by two insurance companies. A \$12 million issue of 28-year 3 1/2% debentures was sold as part of the company's 1947 financing. Despite the effects of that year and 1949, servicing of the debt was never trouble some. A balanced capital structure, that had been maintained by United, stood the company in good stead as it had the rest of the industry subsequently around its current position.

As part of its 1952 financing, another \$10 million in 3 1/2% debentures, but with a 15-year maturity, was sold to the same insurance companies. A feature in United's strong credit position is the successful nature of this debt and the favorable interest terms obtained in 1952 when other comparable corporate issues were made at higher interest rates.

That the trackless studied above now command a favorable credit status with regard to their own securities is a demonstration of the measure of acceptance and maturity achieved by a segment of the industry. Undoubtedly this condition does not apply to these same equity issues. Here, investment support has been discovered by disappointing regulatory policies.

Once again this reveals the degree of selectivity as government in the group, not only as to company, but as to type of security as well—Selig Altschul

New Selective Calling... From Ground To Pilot

Made by the leaders
in Aviation Radio

No more pilot headset fatigue! The new Bendix® SCL-9 Selective Calling System (SELCAL) gives instant notification that a ground station is calling. This notification is made by a light or chime... eliminating the need for continuous use of headsets. Either a single or dual SELCAL system can be provided in one unit.

Selective Calling Works Simply

The old voice calling method is replaced with the transmission of coded tones to the aircraft... over the regular HF or VHF communication channels. Each aircraft may have a specific code and provisions for group calling in a single unit. Two pilots are sent from the ground... receiving approximately two seconds for the complete transmission. Each pulse includes two tones, making a total of four frequencies to prevent false triggering.

The tones are received by a decoder in the aircraft. When the assigned tone code is received... it activates a visual or aural cockpit signal. After the pilot is alerted... communication is carried on in the normal fashion.

Visual Statistics

ARINC reliable tubes... single unit weighs only four pounds. More than 1400 codes available. Easy to remove dust cover to change frequency and easy to service. Remains Read Relays from 312.6 cps to 577.2 cps. CAATC #BRS-22

For further information, write the office nearest you.

Bendix Radio

DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE 4, MARYLAND

Representatives:
Bendix International Division
200 E. 42nd Street
New York 17, N. Y. U. S. A.
Southwest Sales
2300 Lane Field Drive
Dallas, Texas
West Coast Sales
1600 Imperial Boulevard
North Hollywood, Calif.
Canadian Distributors: Aviaton Electric 300 Laurier Road West, Montreal, Quebec



SCL-9A
AIRBORNE SELECTIVE CALLING
UNIT



SCL-9A
SELECTIVE CALLING OSCILLATOR
(GROUND UNIT)



No wonder the other one leaked!



Comparison tests prove Parker-formulated rubber O-rings successfully withstand fluid, temperature, or pressure conditions

1. New nonflammable hydraulic fluids mislead one O-ring... didn't learn the other in this testing test. Both were originally the same size. Yet, one is now swollen, charred and chipped. The other wasn't damaged because it was molded of a Parker compound that resists nonflammable fluids.

Pressure and temperature can also cause problems. When you use Parker O-rings, you are sure to get exactly the right O-ring for your specific application. For instance, Parker's new compound 812-43 fully meets requirements of MIL-E-7562 covering synthetic rubber seals for use in high temperature lubricating oils.

Parker O-rings are approved for all military applications. We invite you to compare Parker O-rings with any other make. Here are some of the reasons why you'll find they last longer and last longer...



2. Elongation, tensile strength and maximum compression settings are determined with care. Laboratory and service tests make sure these rated characteristics are held



3. Fluid and temperature tests check compression resistance to soft, fluid and chemicals at high and low temperatures... insuring the long life of Parker O-rings.



4. Precision molding of superior compounds provides close tolerances. Parker has molds for every standard O-ring size. Half the company for dual



5. Compare actual samples. Ask your Parker representative to check your specifications. Prove how Parker O-rings last longer and last longer.



6. What other Parker products for hydraulic applications interest you? We build jet engine accessories (shown above) for engine fuel, turbine and hydraulic systems.

SEEK PRODUCTS DIV.
SEE PARKER
APPLIANCE COMPANY
Bldg. 308-C

17525 Euclid Avenue
Cleveland 13, Ohio

Please send me the following information:

☐ O-ring catalog No. 3198

☐ New 24 page book about Parker engine accessories, Bulletin No. 122081

NAME

COMPANY

ADDRESS

CITY STATE

SEEK PRODUCTS DIVISION
The Parker Appliance Company
17525 Euclid Ave., Cleveland 13, Ohio
5134 South Fairfax Ave., Los Angeles, Cal.

Parker
Hydraulic and fluid
system components



1. FOIL-DIELECTRIC coil is sliced into wires.



2. WAFER with grid studs (top) for connections.



3. STACKED coils form transformer (toppled view left).



4. OLD WAY of winding coils was production bottleneck.

Slice Technique Cracks Coil Bottleneck

Tube of metal foil and dielectric is cut in desired thicknesses; new method opens way to mechanized production of transformers.

By Philip J. Klass

A radically new technique for making low-frequency transformers and choke coils by winding a sheet of metal foil and dielectric into a tube resembling a long paper capacitor and then slicing it flat before use, may open the way to fully mechanized production of transformers and chokes.

The new "Auto-wire" process, developed by Sylva Electric Products, holds promise of removing a major obstacle to full mechanized production of electronic equipment. It could also eliminate what was one of World War II's biggest bottlenecks—the manufacture of transformers.

Sylva's engineers estimate that the new technique can cut coil manufac-

turing time by a factor of eight and material costs by a factor of three. Sponsored by the Wright Air Development Center's Electronic Components Lab, first details on the Auto-wire process were revealed during the recent San Francisco conference, reported in a paper by Sylva's engineers Albert Zuck, Ted Winkelsch, and Wilson Hunsala.

► **Fully Automatic Production**—Sylva's engineers estimate machinery for the completely automatic production of transformers, including winding and cutting wires, etching and mounting them, easily stacking them onto cores. The company has proposed and hopes to get a USAF contract to develop such machinery.

Based on studies to date, Sylva's

reports that the new technique often "electric savings rely on the loss of natural coils, including anticipated labor savings.

For instance, the cost of raw material to produce a typical audio-frequency transformer coil by the Sylva Auto-wire process is only 5.7 cents versus 17.9 cents for conventional construction, company engineers report. Time required to make coils is only 1.23 minutes for Auto-Wire versus 5.5 minutes for conventional construction, they say.

► **Full Reduced Automation**—Despite recent setbacks in mechanizing large portions of electronic production, the manufacture of audio frequency transformers and choke coils has resisted automation. Even the Navy's "Piggy

Backlog" automatic factory, which makes its own printed circuits, capacitors, and inductors from raw materials, had to use selective components made on the outside by conventional hand processes.

Although machines have been used to wind coils (see photo, p. 55) skilled hands are needed in conventional manufacturing process to pull out the start and finish leads of wire, frequently smaller in diameter than a human hair. Finishing operations, including wrapping, have also involved hand operations.

► **Printed Circuits Rejected**—Printed circuit techniques which had previously been successfully applied to miniature transformer coil construction were investigated first by Sylva, but rejected for audio-frequency use. Materials practical with use of coil conductor formed by photoetch on similar techniques was 0.01 inch, with another 0.01 inch of spacing between turns, Sylva's found.

When stacks of these printed circuit coils were used to make audio-frequency transformers, where some turns were needed, the resulting transformers were two to three times larger than its conventional counterparts. This was too large a size to use for mechanization. Capacitor-Type Construction — If sheets of aluminum or copper foil and dielectric are wound into a tube, much as paper capacitors are formed, these sliced into thin wires, the result is a coil which resembles printed circuit coils but is far more compact.

For instance, in one sample which Sylva built for WADC, dimensions 0.0025 in. thick was used with a paper dielectric only 0.001 in. thick. This gives a total spacing between turns of only 0.0045 in., compared to 0.02 in. for printed circuit techniques, permitting 4.5 times more turns in any given direction. For low-frequency transformers, an addition of this type of dielectric could double on the metal foil could result in even some compact construction.

► **Rectangular Construction**—One inherent advantage of the new process is that it uses rectangles instead of round conductors, giving more efficient space utilization. The thickness of the wires into which the tube is sliced is determined by the current-carrying capacity required. For instance, if the equivalent of a No. 44 wire is needed, and a foil 0.0047 in. thick is used, the wires are cut to a thickness of approximately 0.017 in. Following the slicing, wires are etched to remove burrs, sprayed with a resin to provide adhesion, and are then ready for stacking.

► **Stacking Wires**—Wires once delivered to transformer are automatically assembled to provide a large center hole



Miniature POWER Resistors

fly the airways
with the new Douglas DC-7



Douglas Aircraft Corp.

is only one of many users who have found that Dalohm precision power resistors offer many desirable characteristics — smallest in size, available in tolerance, 100% inspection to maintain constant resistance, rugged construction, TC 0.0001/°C, resistance ranges to 10,000 ohms, tolerance 0.05% to 1%.

used in the DC-7 —

DALOHM RM-250 (250 Watts) 214-Type (also available in 50 and 100 watt sizes) shown wired in constant resistance forward bearing, and mounted on sub-panel for maximum heat dissipation.

write • wire • or call

1100 20th Ave. Phone 2129

DALE PRODUCTS, Inc.

Columbus, Indiana, U.S.A.

in Canada — Toronto, Ont., Canada

IT TAKES TWO

DISPLAY ADVERTISING

- Answers Interest
- Creates Preference

DIRECT MAIL

- Gets Personal Attention
- Triggers Action

After your prospect has been contacted by DISPLAY ADVERTISING, to sell and take one great step. We have it. A personalized mailing piece direct to his desk, in conjunction with a display campaign, is a powerful sales grip.

Advan Mail has a Direct Mail Division ready to serve you with over 120 specialized facilities in the National Field.

To get your very own free INDUSTRIAL DIRECT MAIL CATALOGUE (1954) containing complete detailed information about our services, fill in the coupon below and mail it to Advan Mail.

Do it now! The best advertising program you planned will be useless.

for Results



Mc Graw-Hill
DIRECT MAIL LIST SERVICES

Name _____
Company _____
Address _____
City _____ State _____

Dutch Radar Merry-Go-Round



DUTCH TURNTABLE GCA, a precision approach radar which can be rotated to cover several courses, has been in operation at Schiphol Airport, Amsterdam, since 1951, the Netherlands Civil Aviation department has ordered Avionic West. The Dutch now produces this model turntable radar developed by the Rome Air Development Center (Aviation Week Aug. 17, 1955, p. 290)



TURNTABLE HOUSE, housing radar antennae and operator consoles, can be rotated up to 360 degrees at 36 deg/sec. Turntable design engaged with Netherlands Department of Civil Aviation. The FMR installation was built by Cowi paper Foreman Thomas Blomart in Paris.

They are then graded on a suitable cone (see exploded view, p. 65) and subsequently be caused of small rollers into place at the start and end of the fuel readings, or by other similar means.

Several rollers may be grouped together on the cone, operated by an air pump from the adjoining girth, in addition to the rollers to measure fuel droplets.

• **Cooperation**—On the basis of heated samples made to date, the size and weight of small radio-frequency trans-

mitters built with the new Sylvania technique are consistently the same in units of conventional construction. Albert Zick told Avionic West. Frequent response over the middle radio range (100 to 12,000 cycles) has been "no better, no worse" than for conventional units, according to Zick.

Under an extension of the signal WADC contract, Sylvania is to explore the application of the new process to the manufacture of pulse and high-temperature power transmitters (approximately 100 m).

Improved Precision Resistors Announced

A new-vented resistor which is suspended in a dielectric fluid, encapsulated in a non-hygroscopic resin to make it superior to resistors in one of the most exacting types of precision circuit is now announced. The new "Rho-mat" encapsulated resistor can withstand temperatures up to 150° and is available in tolerances of 0.1%, 0.25%, 0.5% or 1%.

Manufacturer is Rho Engineering Co., 4235 Sepulveda Blvd., Culver City, Calif.

Other precision resistor developments include:

- **Constant-resistance** version of Avionic Corp.'s Carbide base, designated Type CFC, provides hermetic seal and permits a capacitance effect between the element and its case. Units are available in tolerances of 1%, 0.5, 0.25, and 0.1%.

- **Wide-vented** encapsulated, non-polarized, precision air-dielectric bolides, as previously noted MIL-R-938, Amendment 2, at 125°C. Units are available in tolerances up to 145 megohms, tolerance as close as 0.1%, in 1-, 2-, 4- and 1-watt sizes. Chicago Manufacturing Co., 3044 Howard St., Skokie, Ill.

- **Glass-encapsulated**, metal-filled carbon-filament resistors, Models KX1-4-5, provide up to 15 kw. dissipation, most power ranges of 200 to 670 ohms, in 5-, 10-watt ratings, maximum tolerances of 1%, temperature operating range of -55°C to 250°C. Victorelco Instrument Co., Compensator Div., Cleveland, Ohio.

- **Miniature** encapsulated wirewound, Type FEM, designed to MIL-R-95, is available in resistance ranges of 10 to 50,000 ohms for higher-precision order, tolerance of 0.01 to 1%, full wattage to 150W, and temperature coefficient of 0.0002/°C. According to manufacturer, Electronic Pacific Co., Division 10, 7133 E. 5th St., Los Angeles 21, Calif.

- **High-frequency** miniature, Type HPB, 1 watt, in construction of ceramic and to which thin resistive film is bonded. Unit comes in standard tolerances of 1, 1%, and 20%, respectively, exceeds MIL-R-10631A, International Rectifier Co., 401 N. Broad St., Philadelphia 5, Pa.

Makers Give Details Of New Transducers

A new accelerometer, called "world's smallest," by its manufacturer, is one of several recently announced transducers suitable for remote and short-



Illustration: Phillips Research Co., and its subsidiary Manufacturing Co., Mount Airy, N.C.

"See how NEEDLE BEARINGS Simplify Design"

Torrington DC Needle Bearings have a talent for simplifying complex design problems.

Because of their small size, bearings and related members can be made smaller and lighter, shaft diameters can be increased for added strength, and smaller shaft-to-roller distances can be employed.

These benefits are a direct result of the Needle Bearing's unit construction. The design and hardened outer shell, when pressed into a recommended housing bore, serves as the outer race. A full complement of small-diameter rollers provides easy

lines of support for high radial loading. What's more, a hardened shaft serves as a low cost, high quality inner race.

The torsion life of the Needle Bearing retains lubricants effectively and helps insure long service life.

Why not incorporate these advantages in your product? Our engineering staff will be glad to help you with your anti-friction problems.



THE TORRINGTON COMPANY
Torrington, Conn. • South Dear B1, Ind.

Direct Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON NEEDLE BEARINGS

Needle • Sintered Ball • Tapered Roller • Cylindrical Roller • Ball • Needle Roller

Torrington Needle Bearings serve the aircraft industry in many important applications where weight and space savings are vital. On high military and civil aircraft, Needle Bearings give higher-payload performance at high speeds, high altitudes and over a wide range of temperatures.



Get things going... keep things moving...

On-the-spot consultation may spell the difference between boom or penalty. Now with the right answers are reach hard-to-get-to locations with a **BEECHCRAFT**.

Oftentimes it's possible to land your company **BEECHCRAFT** at the scene of activity, or virtually within minutes of the important spot. Furthermore you arrive rested and refreshed, ready for

important decisions, with no worry about making unreasonable assumptions.

Thousands of **BEECHCRAFT** owners daily are cutting their travel time as much as 75 per cent. If you are "pressed for time," ask a **BEECHCRAFT** distributor or dealer to show you the answer. Or write, on your company letterhead, to Beech Aircraft Corporation, Wichita, Kansas, U. S. A.



BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS



SMALLEST accelerometer, magnetometer

instrumentation and telemonitoring purposes.

Made by General Scientific Corp., Los Angeles, the self-inductance strain-gage type accelerometer is thimble-sized, weighs 14 grams, and offers an operating range of 0.5 to 100G with a reported accuracy of 1% full scale. Natural frequency is quoted at 33 to 150 cps, with 0.7 damping. Instrument number of the tiny accelerometer is 1780 77.

Another General Scientific accelerometer is self-generating, requires no external excitation. This model, 6800-79, develops output voltage as high as 2 v and can be operated up to 500C. The device can be obtained with a sensitivity of 0.000G and a full range requires range of 2-150 cps.

Another new breakthrough, for use in temperature detector, operates in the range of -70 to 200C. Made by Thomas A. Edison, Inc.'s Instrument division, Model 321 NVA has a reported accuracy of 1% or better in wide-scale region and a time constant of 0.8 second or better. It is hermetically sealed. The company's address: West Orange, N. J.

New Avionic Switches Come in Small Sizes

Circuit switching devices in a variety of types suitable for avionic use, have recently been announced. They include both switches and relays. The devices are:

- **Button switch**, consisting of a set of



SWAPHELM is button-tilted.

PROBLEMS ?

WE'VE GOT THE ANSWERS TO YOUR PROBLEMS



SOLVED :



for mechanical...electronic...electro-mechanical
components and assemblies

WHITE INDUSTRIES is a leading aircraft-related manufacturer has developed efficient and economical solutions for the most difficult production and developmental problems of industry and government.

Let **WHITE INDUSTRIES'** engineers explain how you can utilize years of experience, integrated facilities, for constant high precision... faster deliveries... lower ultimate costs... to solve all your component and assembly control **PROBLEMS**.

WHITE INDUSTRIES INC. is a subsidiary of WHITE INDUSTRIES INC., 100 West 34th Street, New York 1, N.Y. 10018, Dept. 101



swifly long working in Mayland. HCAO recommended further development and evaluation of U. S. Novosil (Aviation Week '67, p. 32) and its dual component, the British ElectroBelt system, as antenna system replacement after 1964. Other conclusions:

- Secondary radar, for use with airborne transponder beacons, should integrate on a frequency of 1,190 mc, use 1,190 sec. for reply channel.
- Airborne telemetry, for ground-to-air transmission of meteorological and other meteorological information, would require crystal radiofrequency channels.

- Airborne radar does not appear to offer any solution to the air-to-air collision warning problem, but should prove useful for storm and terrain warning.
- Re Specifics—Engineers should be more specific when stating airborne temperature limits for avionic components, Gordon Walker and Richard Hamilton of General Electric told the recent Electronic Components conference. Both are engineers in GE's aircraft transformer department. Their paper cited a design aspect for a transformer to operate for 2,000 hours at 125°C.

When further questioning revealed that the ambient temperature would be 170°C for one third of the operating time, 50°C for the rest, it was possible to reduce transformer weight by 20%.

- USAF Standardization Study—Wright Air Development Center's Electronic Components Lab is studying possibility of industry-wide standardization of avionic components. First report on its study should be available toward end of this year. —TK

- Avionics Literature — Recently announced publications of interest to persons in the avionics field include:

- Transformer series design, minimum inductor for transformer, Motorola Application Note, 441 (Aviation Week '67, p. 32).
- Failure analysis, description, with subject effect analysis for digital logic, 48 pp., Publications Div., 1801 Shuman St., Champaign, Ill.
- A. C. series motor and test procedures, Oct. 2, 1967, pp. 1-10, United Technologies Div., Dept. 2, 1000 N. Sixth Ave., Chicago, Ill.
- Electric motor (10 hp), Allison Electric & Motor Co., 1000 N. Sixth St., Burbank, Calif.
- Automatic control systems and engineering services of the J. S. Fox Co., including software development, design and test of electronic control (24 pp.), Avionics Media Division, C-100.
- Northrup gear reduction system, capable handling 100 hp, 1,000 rpm, 100 ft-lb, 100 in. of gear, General Electric Co.
- Fixed line data relay, designed to MIL-STD-883C and MIL-STD-883D, with automatic data relay, Philips Int'l. Aerial Division, Radio Rec. Int'l. Corp., 1100 Newpark Ave., Mountain View, Calif.
- Remotely controlled operations, fielded systems, Hughes Co., Hughes Aircraft Co., 3000 Main St., Long Beach, Calif.
- Valve to gate is described in technical paper, "Standard Valve in Water/Gas Turbine," Technical Information Service, Progress Corp., 510 Madison Ave., 3, Pasadena, Calif.
- Raytheon electronic circuit board type P-2 and auxiliary electronic components to MIL-STD-883C, Raytheon Electronics, Progress Corp., 510 Madison Ave., 3, Pasadena, Calif.
- Precision semiconductor are described in "A 1000 Series Semiconductor," Raytheon Electronics, Progress Corp., 510 Madison Ave., 3, Pasadena, Calif.

Save up to 150 lbs. per Plane!

with Aeroquip 617 Lightweight Air Frame Hose



THE FITTINGS WEIGH LESS!
Extremely short socket designs use less metal... saves the difference in weight.

THE HOSE WEIGHS LESS!
Thin wall construction and less wire braid half weight to a minimum.

You'll prove the savings in weight when Aeroquip 617 lightweight air frame hose replaces conventional types for fuel and oil lines. On one fighter plane, weight was reduced 35 pounds... or bomb, on another as 150 pounds can be saved with no sacrifice in performance.

Aeroquip 617 hose has been tested, approved and accepted for 125 P.S.I. operation. The same inner tube is resistant to synthetic lubricating oils made to speci-

fication MIL-L-7808 as well as petroleum products. Aluminum fittings are detachable and reusable.

617 hose and fittings are available from stock with AN/28 flanges and standard AN/28 couplings in straight, 45° and 90° elbows. Sizes are —16, —20, —24 and —32.

This is another "Aeroquip Fact" featuring hose and fittings matched for guaranteed performance. Write for Aeroquip Engineering Bulletin AER-5.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN
AERO-COUPLING CORPORATION, BURBANK, CALIFORNIA

(A Subsidiary of Aeroquip Corporation)
Manufacturers of Aeroquip Hydraulic Hose Lines with detachable, reusable fittings; Fuel-Sending Couplings; Braided Aluminum Braided Steel Braided Hoses in standard sizes in S.A. and Aeroquip. — AEROQUIP PRODUCTS ARE FIRST PRODUCED BY PATENT BY U.S.A. AND AERQUIP

Machine Work or Gear Production

PRECISION IS THE WATCHWORD AT ADVANCE

It's a fact that the single most important factor in the production of machine parts is the precision of the machine tooling used. At Advance Gear Machine Corp., we have the equipment and the know-how to produce any kind of gear, pinion, or gear assembly that you need. Each phase of production is carefully supervised and every detail of manufacturing is closely checked to make sure that each part is precision engineered.

Write today, for a copy of our informative brochure "Gears and Gear Production".

Advance Gear & Machine Corp.

214 West 11th Street, St. Paul, Minnesota 55101

Altitude Pressurizer

New low temperature pressurization kit, rated at 280 psi in vac., is designed to maintain constant air pressure at altitudes of 50,000 ft. Developed by Lear Research for a new jet bomber for control system, Model RLR-1030E, using a two-stage compressor, is reportedly able to compensate for temperature leakage of 60 in. inches at altitude with a 25% drop cycle.

Gems for the jets...Hyatt Roller Bearings!

These are just a few of the many who
rely on Hyatt roller bearings:
Bell Aircraft Corporation
Boeing Aircraft Co., Seattle
Cessna Aircraft Co., Tulsa
Curtiss-Wright Corporation
Douglas Aircraft Co., Tulsa
General Electric
Grumman Aircraft Engineering Corp.
Lockheed Aircraft Corp.
North American Aviation
Republic Aircraft Corp.
Ryan Aircraft Corp.
Vought Aircraft Corp.
Wright Aircraft Corp.

When we entered the jet age, Hyatt was well prepared. Years of experience, unequaled research facilities and modern production methods had already made us specialists in the manufacture of high-speed, high-temperature, precision roller bearings. So when the engine builders asked for better bearings of highest quality, Hyatt became a major producer . . . as early as 1944. Whenever design requirements are beyond the capabilities of ordinary bearings, call on Hyatt. Our staff of highly skilled sales-engineers is always at your service.

HYATT

HYATT BEARING DIVISION • GENERAL MOTORS CORPORATION • WARREN, NEW JERSEY

WHAT'S NEW

Telling the Market

Catalog of over 60 pages shows 44 fiscal types of instruments available to the aircraft and allied industries. Write to Booth Aircraft Not Corp., Newell, Conn.

Check Chart for Selecting Corvair Parts is designed to enable customer manager to choose part to meet his particular set of conditions. The chart is available from Wilson and Wilson Co., 173 Lincoln St., Boston 15, Mass.

Fett & Whitney announces publication of illustrated 26-page catalog on its Kellner Carbide Dies. Address: West Hartford 1, Conn. . . . The Vance Systems of Milwaukee Handling is 26-page booklet available from Factory Service Co., 4615 N. Twenty-first St., Milwaukee 5, Wis. Southwest Products Co. is offering two new catalogs: one on pushback systems, the other on Marshall left sloping bearings. Write: 1775 S. Mountain Ave., Denver, Colo. . . . Corp testing machines for metal specimens are described in 12-page Bulletin 4205 issued by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

What is said to be the largest and most complete line of super-precision velocimeters in the market is described in Aerospace Catalog 134. Write: Pyral Instrument Corp., Lynbrook, N. Y.

New Office

Frederic P. Kishall, aviation engineering, has opened offices at 17 Main St., Wapport, Conn. Telephone: Capital 7-3291.

Publications Received

• *Title of Secants and Cosines to Nine Significant Figures* at *Handbook of a Engineer* by Nelson Forman of Standard, Applied Mathematics Series 63-C, Data from Computation Publishing Office, Washington 25, D. C., 52 cents, 46 pp. The series are combined correct to values in units of a cent in the last place given.
• *Viscosity and Thermal Properties of Kerosene*, published by Reinhold Publishing Corp., 110 West 40th St., New York 36, N. Y., \$1.00, 334 pp. A review of the work done in various publications on kerosene, supplemented with information obtained from the producers of the commercial materials.
• *Energy in Science* by Albert Einstein, published by the Philosophical Library, 1146 St. Ave., New York 36, N. Y., \$2.75, 114 pp. An abridged edition of "The World as I See It."



Cornelius

PNEUMATIC COMPRESSORS

FOR



NAVY CUTLASS

Chance Vought Aircraft uses Cornelius as compressors on the F7U-3 Cutlass, supersonic Navy fighter. In specifying Cornelius compressors, Chance Vought recognized the need for a compressor that would perform well at high ambient temperatures and altitudes.

These Exclusive Design Features Show Why Cornelius Air Compressors Run Cooler Than Any Other Compressor

1. Flare of compression distributed over six cylinders.
2. Cooling fan is 8 inches in diameter with 14 inch pitch.
3. Cooling fan runs at 3000 RPM.
4. The six cylinders have a total fan cooling area of approximately 900 square inches.
5. Intake valves are located in sides of cylinders—not in box cylinder heads.
6. Finned cylinders are made of aluminum to provide for more rapid heat transfer.
7. Hot processing parts pass over cool water.

If you have a requirement for a compressor to operate under high temperature and altitude conditions, please permit us to furnish additional information regarding our units. We will also gladly supply compressors on consignment, to qualified users, for test and evaluation.

CHANCE VOUCHER
F7U-3 CUTLASS
Supersonic Navy Fighter



THE
Cornelius
COMPANY
MINNETONKA ST. MINNEAPOLIS

PIONEERS IN THE DEVELOPMENT OF AIRCRAFT PNEUMATIC SYSTEMS

Taloa Tests Anti-Collision Lights

Blades reports the apparent motion of the lights can be seen even at low night-off when approaching ahead or astern.

Work force in the show will go up

• An negative
correlation exists

and main dial and a ventral dial which
is on a mobile dial.

06-118 00-1 07100 00000 100

100

Avien's EGT system tells you 4 times more accurately!

- A self-balancing bridge that makes the system independent of lead length and lead resistance
- An improved method of compensation that eliminates effects of ambient temperature over a range of -35°C to $+35^{\circ}\text{C}$.
- An expanded main dial and a vernier dial which permits resolution to within 2°C .

Data sheets on Aresco's EUT systems are available.

Plans shown on AutoCAD EUT systems are available



these **NYLOK**



will solve your fastener problems
at *Lower Costs!*

NTLDR sees past self-lubing fasteners
on manufacturing and maintenance
aspects, gives a better fastening and im-
prove product appearance. That's be-
cause NTLDR fasteners eliminate costly
safety wiring lock washers, jam nuts and
other devices.

The NYLON principle® leads flange assembly at any position needed to be stopped. The resilient nylon plug provides a smooth wedging action which is release-demanded and will not over tighten the

Does it provide a leak proof seal where liquids are present?

ONE PRICE NYLON CONSTRUCTION eliminates expensive extra locking parts, is always there so you can't be left out or forgotten. The construction also means that NYLON fasteners give you faster, easier assembly time. NYLON fasteners can be reused many times.

• Let **WTOL** engineers help you solve your packaging problems. With, and let your needs and **WTOL** and more will make recommendations at no charge.

• **“What’s the deal?”**
 “Well, the deal is that you’re up there!”

thought, assuming "wrong" thinking. We're the hospital. All of our thinking revolves around the disaster event and we're focused looking to positive control or containment. Prevention keeps going and what's possible



For full specifications and details of service visit www.fox.com

NYLOK Corporation

Manufacturers of Nylon Locked Fasteners owned by U.S. patents and patents pending

Main Office and Factory — Elmira, N. Y.

Office in New York City • Boston • Chicago • North Hollywood

from 1,500 to some 2,000. A new building is under construction which will provide space for deep hammer, welding and short radial work on its lower floor, with engineering, painting and stores occupying the second floor.

A new hangar will house a DC-7 or two Convair. This hangar also will take a jet engine of 200,000 lb. size when the time comes, the airline executive asserts.

Introduction of the DC-7's Turbo Compound engine into the overhead facility has brought only a few new problems, according to the Usual suspects.

Special hoisting equipment has been purchased for the Turbo but this also will be useful elsewhere, as in propeller work.

► **CAL** Modifications—Might modification undertaken during the seven-day "penance" period by the new adherent is adopting the forced steps out for burning instead of penance.

United will have no passengers in the forward compartment. But since the compartment itself is smaller, United actually will lose a total of only two seats, giving DC-7s a 68-passenger capacity as against 62 for American Airlines, which uses the most compartment for passengers.

After tests made on a mockup of the new cargo pet, UAL officials decided it would result in much faster baggage handling, thereby cutting ground time for passengers. Since the suitcases will be on skids, damage to baggage also will be less.

On routes other than nonstop it also will speed baggage handling for intermediate stops, since containers destined for such stops may be grouped on the planes.

There is a slot for hanging garment bags as well as a hanging section which makes it possible to fit garments into the shelves. Baggage will be loaded and unloaded through the screen door of the case compartment. The new baggage section will hold 65 suitcases.

Another modification includes removal of the right-hand headlamp in the new compartment and installation of a folding observer's seat in front of the cargo door. This is for better clearance of flight procedures. Fuel overwater sensor, that seat will be removed and over-water sensor equipment installed in the nose.

Many of the United installations are for utility purposes: incandescent flashlights, evacuation slides, pilot's egress ladders. Others now being designed are for passenger convenience: a plastic baby crib for mounting on the forward cabin wall, a small card table for center aisle use.

Other work during the "pre-service" clerk includes installation of seats.

beyond the sonic wall

precision *spells*
performance!

• New heights of performance, demanded by supersonic flight, also demand new standards of precision... precision assured by the know-how and production facilities with which we have served the aviation industry in development work for many years.

We manufacture precision gear assemblies for accessory drive units, actuators, transmissions, computers and controls. And we also produce complete components such as bomb bolts, gun turrets, radar tracking and scanning assemblies, hydraulic actuators.

Make your development and production problems our problems. We're qualified by long and proven performance to solve them... large or small. A letter or telephone call will put us at your service.



THE STEEL PRODUCTS ENGINEERING CO.

ENGINEERS AND MANUFACTURERS • SPRINGFIELD, OHIO

AEROTEC**FLOW INDICATOR****specified for USAF combat Jet**

Behind the thousands of AEROTEC B-20004-RW Flow Indicators and Check Valves now in service are months of development and tests. An important safety feature of this control is a solid metal wall between switch housing and fuel chamber. The unit is designed to function at a specified flow rate and prevent reverse flow while operating in any position. Metal to metal valve seating eliminates O-ring swelling, sticking and assures long life. The AEROTEC B-20004-RW has passed Spec MIL-E-8272 and is suitable for fuels AN-F-32a, AN-F-48b, AN-F-56a.

Modifications to the following specifications of the B-20004-RW are available. Close electrical circuit on increasing fuel flow at 400 lb. per hr. and above, reopening circuit when fuel flow decreases below 400 lb. per hr. Maximum pressure drop through valve not over 4" H₂O at 1000 GPH flow.

Check valve characteristic Rate of leakage on reverse flow does not exceed 1 milliliter per minute when pressure from 75 psi to 4" fuel not applied to outlet port. Will withstand vibration frequencies of .010 double amplitude from zero to 100 cps and ± 5 g's vibratory acceleration from 100 to 200 cps. Let AEROTEC'S qualified engineering staff help solve your automatic control problems in the aircraft field. One of our specialists is near, ready to serve you. Call or write him today.

When you think of Automatic Aircraft Controls, you should automatically think of AEROTEC.

Project Engineers

THE THERMIX CORPORATION

ROSWICK, CONNECTICUT

(Offices in all principal aircraft centers)

Executive Offices: 5, C. CHURCH, LTD., Roswell 13, Boston • Toronto 5, Ontario

THE AEROTEC CORPORATION

Aircraft Division

ROSWICK, CONNECTICUT

Designers and Manufacturers of Automatic Controls—Valves Regulating, Relief and Check Types—Pressure Switches—Gages—Altimeters—Differential and Absolute Types—Fuel Switches—Taps, Valves and valve assemblies—Single, Dual, or Triple.

cigarettes and food boxes.

Chrysler's DC-7s will be in transcontinental country service from both San Francisco and Los Angeles to New York before the end of July. Scheduling of DC-7s on the Honolulu run still is "in debate," the airline says, but is expected early next year.

NEW AVIATION PRODUCTS**Small Airborne Motor Delivers Smooth Torque**

Clifton Precision Products Co. announces development of DC-5-A-1 precision-torque-type direct current motor for use in airborne navigational, fire control and photographic equipment. Diameter is 2 in., length 14 in.

Unit is designed for 24-v operation, but other voltage ratings are available.

Rated speed is 25,000 rpm, and maximum shaft torque is 1.8 oz. at 100% power at the shaft is more than 6 watts at 12,500 rpm, and maximum efficiency exceeds 70%, Clifton says.

Motor features 12-rotor construction which enables it to deliver torque smoothly without torque effects of line speed, Clifton says. To maintain noise interference, an internal resonator is incorporated across the brushes.

Unit is available with either lead or some-type terminals.

Clifton Precision Products, Inc., 4 Maple St. Rosbury, Clifton Heights, Pa.

**New Hand Grinder Offers 700-50,000 Rpm. Range**

Metal Removal Co. is introducing a new hand grinder with speeds variable from 700 to 50,000 rpm.

Known as "Ultra-Flex," unit has



World's largest—Ryan fuel tanks for B-47 bomber

THE PROBLEM: The world's fastest bomber, the four-engine B-47 Stratojet, needed the world's largest wing fuel tanks... tanks with a capacity equal to that of a good-sized tank truck. What's more, these tanks had to be completely gas-tight by welding alone. **THE SOLUTION:** Having turned to Ryan who devised ingenious methods to manufacture in volume the large, external tanks—each of which requires more than 30,000 electrical spot welds.

Bomber developing and manufacturing products of its own design, Ryan produces airborne components to precise construction specifications. Typical of these are other "range extending" products, like the Ryan-built air fuelages and refueling pods for Boeing's KC-97 military refueling plane.

These accomplishments point up Ryan engineering skill... skill that has been specialized, ingenious and versatile for 31 of the 50 years since powered flight began. Master craftsmen, Ryan does the difficult, the intricate, the precision jobs of today's high-speed air age.

RYAN AERONAUTICAL COMPANY

Factory and Home Office: Lindbergh Field, San Diego 12, California
Other Offices: Washington, D.C., Dayton, Ohio, Seattle, Washington, New York City



Ryan builds Boeing KC-97 fuel tanks, too.

RYAN

SPECIALIZED
INGENUOUS
VERSATILE

Advanced Type Aircraft and Components
Jet and Rocket Engines and Components
Exhaust Systems for Aircraft
Guidance Equipment
Services for "Jet Turbines"
Weapons Systems Design and Management
Aircraft and Power Plant Research
Aeronautical Engineering
The "Hot" Guiding
Nuclear Motors and Parts

Planners in Back • Leaders in Air

CASTINGS on the lighter side by WELLMAN

Choose a manufacturer whose business you're in...
manufacturing household appliances...
providing transportation for people or products...
producing farm equipment, or traffic equipment, or portable tools...

Here's a WELLMAN aluminum or magnesium casting somewhere in the picture.

For almost half a century we've been producing castings on the lighter side to fill a wide range of specifications — and we know what it takes to do it. We know the importance of constant research and laboratory control, of the finest production methods and equipment, and of experienced people in all departments.

Our four complete plants and staff of competent personnel are geared to meet any casting requirement. Let us hear about yours.

New casting No. 53 on request.

Well-Cast MAGNESIUM AND ALUMINUM CASTINGS
Well-Made WOOD AND METAL PATTERNS



THE WELLMAN BRONZE & ALUMINUM CO.

Dept. 5, 12800 Shaker Boulevard Cleveland 26, Ohio

1 hp., 1-phase motor with a Wheel pulley drive. Head dial controls flexible drive/shut in order to regulate rate of speed.

Manufacturer states it is simple and economical to operate since wire is measured by suction of gears from the design. It will rotate inside turn, measured which, sleeve drive, feeding wheels and guiding wheels from 4 in. to 7 in. diameter.

Metrol Removal Co., 1546 N. Orleans, Chicago 10



DIE CUT wrench is custom made.

Die-Cutting Trims Cost Of Custom Wrenches

Process for manufacture of custom made die-cut wrenches in small lots without conventional tooling costs is reported by Dayton Rogers Mfg. Co. The company employs a stamping method for production of almost any type of box or open-end wrench in place of expensive drop-forged mill wrenches.

Units typically can be made in any size up to and including an overall length of 20 in. They can be blackened and polished from almost any sheet metal alloy, and heat-treated to the desired specification, the manufacturer says.

Under this process, the life is said to be good for about 10,000 parts. Initial cost of the first finished wrenches shown above was \$120, notes company, with subsequent finished units priced at \$75.

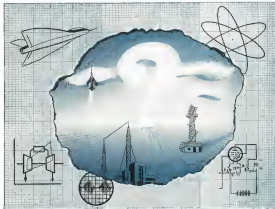
Dayton Rogers Mfg. Co., Mansfield 7, Ohio.

Electric-Grade Plastic Easy to Machine, Drill

National Volcanized Fibre Co. has developed a paper-base electrical grade plastic which reportedly is easier to machine than other plastics of this type.

The new high-pressure laminate is said to possess excellent dielectric strength, low dielectric factor and good moisture resistance. Its advantages it apparently makes better than paper-base phenolic (NEMA

NEW HORIZONS IN ENGINEERING



When products are undefined but performance can be specified

... the Special Products Division of I-T-E may be helpful

We don't claim to solve all development problems to meet performance specifications, but we may have the answer you're looking for. Our record in helping with unusual and advanced developments is impressive. Our current projects range from design, development and fabrication of Radar Astrom Systems to equipment to operate on advanced Thermodynamic theories. Whether your problem is new development - or fabrication with new and hard-to-work alloys - you'll want to know how this unique organization can help you.

Send for Publication SP-100 A 6 today



SP-102

SPECIAL PRODUCTS DIVISION

I-T-E CIRCUIT BREAKER COMPANY

401 E. Erie Avenue • Philadelphia 34, Pa.

Progress through Problem Solutions

RADAR ANTENNA SYSTEMS
Design, development and fabrication of equipment and components.

JET ENGINES
Manufacture of major jet and components.

THERMODYNAMICS
Design, development and fabrication of equipment to operate on advanced thermodynamic theories.

GUIDED MISSILES
Aerodynamic characteristics.

HYDRAULIC
Design, development and fabrication of equipment and components.

SPINDING
Manufacture of spinning and drawing to the final product. Variety of designs in a wide range of sizes.

To Better Serve You



Warner Doubles Plant Facilities Steps-up Precision Subcontracting Work

The Warner Division of Detroit Harvester Company has moved into a new and larger manufacturing plant.

In addition to permitting an increase in the production of hydraulic units of their own design, such as pumps, valves and actuators, this expansion places Warner in a position to take on additional precision subcontracting work for aircraft and aerospace plants.

Captives on Warner's ability to manufacture in existing volumes.

Consider Warner for the production of—

Loading Gear Cylinders, Pumps, and Valves
Hydraulic and Pneumatic Assemblies
Aircraft Fittings
Machining of Aircraft Forgings

Contact our home office in Detroit or the branch office nearest to you. Warner engineers will welcome the opportunity to serve you.

J. I. MCARTHY

320 West Avenue, Room 212
Herrin, Connecticut
Phone: Vindicator 8-1524

JOSEPH ENGINEERING CO.

7227 W. 90th St.
Los Angeles 45, California
Phone: Glendale 2-1658

C. PALMER BOYLES

26 Canterbury Drive
Darien, N. Ohio
Phone: Walnut 4247

M. E. DOUGLASS

2242 Forest Park Blvd.
Port Worth 15, Texas
Phone: Wilshire 2-1535

Warner Division of Detroit Harvester Company
14899 TISHMAN AVENUE • DETROIT 25, MICHIGAN

DESIGNS AND MANUFACTURES HYDRAULIC PUMPS • VALVES • ACTUATORS



NEW PLASTIC (left) puts less burden on motor than old (right)

Grade XXXX and paper base modulus (NEMA Grade XX N), up the same list.

The exclusive polymer reportedly can be punched to thickness up to 1/4 in., a maximum of 1/32 in. is possible for comparable modulus and in electrical applications. Sections up to 4 in. can be shaped by drawing and it can be drilled, milled, turned and milled using standard tools.

National Velumed Fiber Co., Wilmington, Del.



HOLDER for three-way carbide blank

No Carbides to Grind With Holder-Blank Setup

The combination of a new tool holder and "three-way" carbide blanks eliminates the need for carbide grinding. Developed by Vancley-Ramet, the three-way blanks are available in all sizes of triangles, squares and round toolholders for use on all cutting edges without grinding.

The toolholder is designed with a "hook-in" carbide chiselpoint, and to provide correct chip formation over wide cutting range for single chip-breaker width, eliminating all chip-breaker grinding.

The toolholders are also available with twisted rake or negative rake. The rake instantly is easily changed with out removing the toolholder from the tool post by a simple interchange of parts.

The company says the toolholders eliminate tool cracking caused by bending stress, and less of a complete bound tool due to carbide failure, a large cutting edge automatically positioned.

Vancley-Ramet Corp., Waukegan, Ill.

FROM BLUEPRINT TO BLUE SKY ... 28,000 INSPECTIONS

Exceeding even rigid Air Force requirements, the Fairchild-Air Force Quality Control team puts every C-119 through more than 22,000 different inspections before its initial acceptance flight.

Working under inspection principles regarded as a model for the entire aircraft industry, the Fairchild Quality Control team insures topmost quality in tools, materials, parts fabrication and assembly.

This includes inspection of the more than 22,000 parts that go into a "Flying Boxer" as well as more than 6,000 assembly-line inspection points.

The same strict safety assurance measures that guide C-119 inspections are applied equally to its new assembly-line mate, the Fairchild-built C-122. Together, they are testimonials to Air Force quality standards and Fairchild Quality Control and Production.

Other Divisions

American Helicopter Division, Mechanics Beach, California;
Engine Division, Farmingdale, N. Y.; United Machine Division, Woodstock, N.Y.;
Brake Division, Englewood, N. Y.; Speed Control Division, Waukegan, Ill.



TRUST AND WORKING COOPERATION
FAIRCHILD
Aircraft Division
WILMINGTON, MASSACHUSETTS



World's largest high-alloy weld is 67 square inches... IT'S BEING DONE AT CLEVELAND PNEUMATIC

In a blinding shower of sparks two solid steel railroad car axles can be welded into one length in only 108 seconds.... or...

Two heavy-wall alloy steel tubes 26" in diameter, 1" wall, can be joined with a weld that is actually as strong as the tube walls.

In the Cleveland Pneumatic plant, the world's largest and most powerful general-purpose flash-butt electric resistance welding machine is now at work joining aircraft components. This machine can butt weld high-alloy steel pieces having a total cross-sectional area of as much as 67 square inches. With low-carbon

material, this area can be as large as 100 square inches.

A limited amount of this machine's extra time is available now on a contract basis. It can be useful to manufacturers who have the problem of getting higher-quality large-area welds on high-alloy steels at low unit cost.

Write for Booklet D-44, which describes this machine and its capacities, and also tells you how our Contract Welding Department can work for you.



Cleveland Pneumatic
Tool Company CLEVELAND 4, OHIO

Department C-64

ROLL-SCREEN MACHINISTS • AIR-DRY IMPACT AIRBORERS • World's largest Manufacturer of Aircraft Landing Gears

AIR TRANSPORT

SAS Ready to Fly Polar Route to Tokyo

- All operational problems solved, executive says.
- Japanese air agreement clears political barriers.

By A. W. Jessup
(McClure Mail World News)

Tokyo-Scandinavian Airlines System has lifted all operational problems on the proposed Europe-Euro-Tokyo polar route and may begin scheduled flights by next spring, SAS executive vice president Per M. Bucke reports.

He says the second trial flight last month between Scandinavia and Tokyo proved to the airline's satisfaction that its transport route is ready.

• **Sale Service**—Navigational systems are developed enough, says the SAS system and the British "Polar Path" give responses to make the route as safe as any in the world, says Bucke.

He discounts the effect of occasional radio blackouts that result from transpolar disturbances over the polar region. In the first place, these occur only once or twice a day in winter, so schedules can be canceled if necessary. He believes, however, that such radio blackouts rarely would be necessary.

The longest blackouts are seldom more than three hours, and he says no means any places should not fly over a route where they seldom would be more than an hour from some Canadian or U.S. air installation or America's Fairbanks area with occasional radio blackouts.

Whether or not continued sea problems by SAS. The airline expects present conditions will be superior to any other route from Europe to the Pacific region. All across the polar region, there is a close dry ice, with none of the up and down air currents of the temperate and tropical zones. In addition, there are no mountains.

• **SEASIDE FLIGHT**—The DC-8 flight from Oslo to Boston, Norway, Fairbanks, Alaska, and Sheeny to Tokyo took 12 hours flying time, including a diversionary over the North Pole. Normally, the Pole would not be a check point.

Flying time by regular routes from Europe to Tokyo, covering 2,600 odd nautical miles, is 14 hours.

In addition to shipping flight hours, SAS expects less ground time will be necessary. There are only three stops between Oslo or Copenhagen and

SAS Los Angeles Agreement

Talks between the U. S. State Department and Scandinavian governments to revise the present bilateral air transport agreement probably will begin soon. This is the immediate expectation in the State Department's office to provide Scandinavian Airlines System a West Coast branch in the U. S. for the airline's proposed transpolar route. SAS needs a new route across the top of the world from Scandinavia to Los Angeles via Greenland (Aviation Week Mar. 29, p. 5).

The United States also has proposed flights to the most polar route, a three-year experimental limit on SAS operation, plus an exchange of data covering the route in the next two years.

The Department has asked for an exchange of notes between the two governments in an effort to get negotiations started to revise the present air transport agreement. It is not likely the Scandinavian governments will back the U. S. proposal, department spokesman says, because SAS already has sought the route to Los Angeles.

Last March, the ambassador of Norway, Sweden and Denmark signed Under Secretary of State William P. Hall's

to seek reconsideration of State's earlier decision to grant SAS use of Seattle as its West Coast branch rather than Los Angeles.

The airline says Los Angeles generates 18 hours as much European traffic as Seattle. SAS also figures the flight will be faster, saving 30 minutes en route to Los Angeles than Seattle. The Scandinavian carrier also contends the difference between Seattle and Los Angeles is impossible to justify in the selection of Los Angeles over Seattle.

Once State and the Scandinavian governments are agreed on a revised agreement, SAS will apply formally to Civil Aeronautics Board for permission to fly to Los Angeles. CAB says the State Department already has agreed to approve this route (Aviation Week Jan. 7, p. 7).

The issue to be resolved in upcoming talks is that providing for control of frequency of flights across the route within the limit of the Board's approval.

SAS has announced plans to resume operating the transpolar route this fall. That H. Nilsen, SAS president, so states the U. S. request for reciprocal rights under the new agreement to Norway, Sweden and Denmark.

Tokyo "over the Pole." With less air traffic, better weather conditions and probably less fuel burn, ground time for the trip may be kept to less than four hours. At least eight hours are required via the Middle East and South Asia.

The through passages to Tokyo and Fort Air also may find the stage more pleasant. The avoidance of north Norway and Alaska may be distinct contrast with the tropical route.

• **PALE, INTEREST**—No political problems loom for the operation. The bilateral agreements of the three Scandinavian countries and Japan satisfy the policy routes. All SAS has to do is have the necessary letters patent to the Japanese government.

Japan Air Lines, of course, expects reciprocal routes over the polar region to the Scandinavian countries. JAL is interested, but does not expect to fly transpolar flights until its trans-Pacific and Orient routes have been developed more fully.

• **USAF Threat**—About the only air operational problem SAS faces is the U. S. Air Force threat to close down operations at Sheeny in the Aleutians.

This would force some revision of the airline's plans to fly via Fairbanks and Sheeny.

Norwegian Civil Aviation also would be affected by this possible withdrawal.

The SAS airline might want to hold off at the time of the Aleutian crisis to examine its possibilities as a base.

• **Easy Thru-Lines**, when SAS returns to DC-8, it may make the Europe-Tokyo trip in three flights, stopping only at Boston and Fairbanks.

From Tokyo to Europe, the route should be an easy haul. With over the North Pole, the airline has the right that provides a success. The Fairbanks-Tokyo flight is two hours over the Tokyo-Fairbanks hop.

Some Japanese are apprehensive about the risks and dangers of the polar route.

Bucke suggests that the Japanese probably are less dangerous than sharks in certain of the ocean regions.

He also claims that those who will be lost in the "darkness" of the sea than in the ocean. And, the SAS executive adds, few passenger aircraft have died anyway.

CAB Awaits AA Crew Time Reply

Civil Aeronautics Board last week received a reply from American Airlines to "clarify" the interpretation of Civil Aeronautics Administration that AA be forced to fully oversee operations of its contract leasing DC-7s.

Announced meaning DC-7 flights were operating beyond the 15th, but for single crew, as by Civil Air Regulation. As of May 31, the airline has been unable to meet CAA Administrator Fred B. Lee's stipulation that it must assume full of its scheduled routing flights within 30 days between April 20 and July 1 (Advance Week June 7, p. 112). AA's schedule is 7 hr 55 min.

Conway Letter-CAB believes that, even though American could not keep within its schedule during the winter season, perhaps the more moderate summer climate would make such an operation feasible.

In a letter to American president C. R. Smith, CAA Chairman Clark Gurney says that since CAA's complaint "imposes neither a proceeding for the enforcement of economic regulations provisions of the Act nor regulations under the Act, nor an agreement to reconstitute the schedule to be followed in addition thereto is not specifically prescribed by the Board's rules of practice.

"It does appear, however, that American Airlines is entitled to an opportunity to satisfy the complaint before the Board determines whether to proceed with a formal investigation."

Gurney says the Board will determine what action must then be taken to "achieve compliance with the Act."

July 1 Deadline-CAB has yet to decide on a utility American requested to permit it to continue DC-7 operations beyond the 15th, until United and Trans World Airlines. American AA is seeking for extension to 12 hr, the limit for international operations.

In that connection, the Board recently has announced it is considering allowing the airlines to extend the 12 hr domestic flight time limitation to 12 hr for nonstop (transcontinental) flights with their new member. Conclusions will be reported until July 1.

Plan Extension-At Los Angeles, American claims that if pilots are permitted to fly 12 hr a day, it would mean a 16-hr working day. ALPA has told CAB it would "decide" responsibility for accidents resulting from overwork/long hours.

The pilots' union charges that American has been violating the regulations for six months. The government failed to put a stop to it until pilots insisted and AA then attempted to have the regulation changed "to make legal their illegal operation," says ALPA.

New TWA Nonstop

Application for new nonstop service under flight-New York-Los Angeles and San Francisco-New York-also filed last week by Trans World Airlines with Civil Aeronautics Board.

Scheduled time for the New York-Los Angeles flight was listed by TWA at 7 hr, 55 min. Flight time for the other route, San Francisco-New York, was listed at 7 hr, 35 min.

TWA's proposed flight time for New York to Los Angeles was called a "paper schedule" by the Air Line Pilot Association. The previous schedule for Civil Air Administration is seriously opposed by American Airlines, charged for government flight regulations, now in its seventh month without effective enforcement action by Civil Aeronautics Administration or CAA and indication of what we are aware of the situation continues. ALPA, which is an official complainant to the Board.

The airline and operators, personnel estimated the schedule so that they can in fact, TWA has been flying the scheduled Los Angeles-New York but once last October and again the flight, have operated as between the scheduled time has both southern and northern routes of 7 hr 35 min.

"Should these routes be granted and an accident occur when the pilot has flown as much as being scheduled for a winter, says G. N. Sweeney, ALPA president, "it is justified that the trading might be pilot error."

"We suggest that the crew will not have been the pilot's and the responsibility must be assumed by those who would permit such a situation to arise."

CAB Asks \$2 Million From Braniff Subsidy

Civil Aeronautics Board has given the first demonstration of a firm policy against receiving off-incoming airlines to subsidize in order reducing Braniff Airways' claim for 1954 domestic annual pay from \$4.6 million to \$2.8 million.

The Board notes that findings:

- Recommendations against any subsidy at Braniff's Route 9, which went off subsidy Oct. 1, 1951, but considers that a "mandatory subsidy" of \$310,000 "might be deemed" by the carrier for that route.
- Recommends a subsidy allowance of \$1,350,000 for Braniff Routes 20, 40, 46, and 106, which represent the operations at

Mid-Continent Airlines prior to the merger of the two carriers. The allocation, CAB says, is \$205,000 less than the annual subsidy paid to Mid-Continent immediately prior to the merger.

- Declining total pay and subsidy resulting from replacement of DC-7s, DC-4s and Convair 240s in Braniff's fleet with Convair 340s. The Board bases its computation on seven DC-4s (which Braniff owns but is not operating in scheduled service) instead of seven 340s (in actual operation). The airline's domestic fleet consists of 24 DC-3s, 25 Convair 140s and four DC-6s.

Following the president at the Federal Aviation Board announced, making new equipment with subsidy, CAB declares: "The imposition and introduction into revenue service of 25 Convair 340s within a relatively short period of time has resulted in a substantial increase in total per passenger costs over the level which would have obtained had a larger number of Convair 140s been acquired and had some of the aircraft retired been continued in service."

"It is a justified Board policy that consistent substitution of this character which result in an unbalanced increase in subsidy requirements, will not be undertaken with current aid pay."

The Board estimates that \$599,000 of the total total pay of \$2,355,000 proposed for Braniff for 1954 is current aid pay, leaving the \$1,356,000 subsidy for former Mid-Continent operations.

CAB Asks Subsidy Offset Legislation

Civil Aeronautics Board has urged Congress to pass legislation that would permit it to continue its practice of setting aside total aid pay rates for separate classes of airlines.

A Supreme Court decision in the Delta-CAB Air Lines case realized the practice offsetting. Denying the carrier \$614,000 back aid pay, the court decided that under the 1938 Civil Aeronautics Act subsidy must be measured by the "retention" of a line's operation.

The court requires that earnings of one division of a carrier offset the subsidy requirement of another division. Following a bill introduced by Sen. Pat McCarran that would authorize the Board to establish different rates "for different classes of service, including different operations or geographical divisions." CAB Chairman Clark Gurney reported to Senate Interstate and Foreign Commerce Committee: "The Board is in favor of this amendment since it believes that from the point of view of an owner concerned its former position was sound and sound as the best interests of air transportation."

Douglas Forecasts 100-Passenger Jet

Los Angeles-Firm concept jet engine developments will make commercial jet transports with a takeoff weight of 250,000 lb and ability to carry 75 to 100 passengers, according to Douglas Aircraft Co. President Donald W. Douglas, Jr., vice president of Douglas Aircraft Co. At a luncheon meeting in honor of Airlines Day at the Downtown Officers' Club at Los Angeles, Douglas



First View of Boeing Jet Transport Cabin

Interior of the new Boeing 707 jet transport prototype (top photo), viewed from the control cabin, shows indications of the inside of the plane in progress. The jet is likely only one month.

told of two new types of transport airplane he predicts will be flying commercially within the next 18 years:

- A small to medium-size plane for short-range operations that will carry 50 to 75 passengers up to 450 mph.
- A 400,000-lb. transport capable of carrying heavy cargo loads or large numbers of aircraft passengers at low rates over long ranges.

"The entire industry will not, and must not, become complacent for its ultimate decline but by no means been reached," Douglas says.

Colombia Awaits Five Big Airports

Bogota, Colombia-A \$30 million \$25 million airport development program, which will result in five terminals capable of handling heavy air traffic, has been started by this country.

The new airport construction includes:

- Bogota International Airport, 512 million \$16 million for a four-to-five year project on which work began June 15. Two parallel runways, each more than 11,000 ft long, will be constructed.
- Cali International Airport, where work also started June 15 on the \$2-million project. A 5,500-ft runway will be laid down here.
- Barranquilla also the large object of the Magdalena River. A 6,000-ft runway is planned. Construction, estimated at \$2 million, began June 15.
- Island of New Andes in the Caribbean Sea, 5,000,000 Work is scheduled to begin in August, with plans including a 6,000 ft runway.
- Letras Internation Airport, 5600,000 work starting in a six, 6,000 ft runway in July.

IATA Unit to Study Airline Copter Use

International Air Transport Association has formed a helicopter committee as a "task force" to study legislative and regulatory problems that may arise from helicopter operations.

This committee, an advisory body group, will try to speed the possible use of helicopters on international routes. It also will study standardization and simplification of the aircraft.

A third field of activity, launched in 1951 at the IATA conference on helicopters at Puerto Rico, will be to develop rules for use of what is now a small number of helicopter carriers of helicopter helicopters.

New ICAO Officers

Montreal-International Civil Aviation Organization has elected Walter J. Beattie of Argentina as president of its eighth session, now in session here.

New vice president F. A. Gilius, New Zealand's director of civil aviation, group Capt. I. H. Cameron, director general of Egypt's Civil Aviation Department, K. T. B. Kerebekian, Civil Aviation Director for Finland and Col. J. Teller, Colombia.

C. W. Lewis, Undersecretary to British Minister of Transport and Civil Aviation, has been elected chairman of the administrative commission.



R-2800's 31°-51°-75°

Three engines are built into CAA approved standard and have full ACR CAA approved outside in induction system allowed in Street phase development. They have also been built tested in our modern test cells and have been prepared for basic form storage.

C.A.A. APPROVED OVERHAULS
• 5-1159-01 • 5-1159-02

ALL YOUR AIR ENGINE SALES COME FROM US IN WARRANTY

C.A.A. APPROVED REPAIR STATION NO. 1096 AND 104
Following cities: POWER PLANT—Class 2 Licensed and
APPROVED—Class 2 Licensed

AIR CARRIER ENGINE SERVICE Inc.
401 Alameda Street
P.O. Box 288, Alhambra 44, Florida
Telex "44444444"



PBY5A Specialists



Complete Overhaul & Maintenance of All Types of Aircraft

WE HAVE SEVERAL PBY5A AIRCRAFT FOR SALE
EXCLUSIVELY FOR SERVICE & LEASE RATES
IDEAL FOR COAST GUARD

Southern California Aircraft Corp.

Box 128 P.O. Box 1287 San Bernardino, Calif.

WANTED AIRCRAFT PRODUCTS EAST COAST DISTRIBUTION

Group of Sales Engineers (Registered Professional Engineers) with established contacts, offices and experience, desiring to represent established manufacturer.

3450 N. Hollywood Blvd., Suite 100
Hollywood, California 90028

APPROVED (100% C.A.A. Approved) in office and on the
ground. 100% C.A.A. Approved. 100% C.A.A. Approved.
100% C.A.A. Approved. 100% C.A.A. Approved.

POSITION VACANT

AIRCRAFT ENGINEERS (100% C.A.A. Approved) in office and on the ground. 100% C.A.A. Approved. 100% C.A.A. Approved.

POSITIONS VACANT

ENGINEERS (100% C.A.A. Approved) in office and on the ground. 100% C.A.A. Approved. 100% C.A.A. Approved.

ENGINEERS (100% C.A.A. Approved) in office and on the ground. 100% C.A.A. Approved. 100% C.A.A. Approved.

ENGINEERS (100% C.A.A. Approved) in office and on the ground. 100% C.A.A. Approved. 100% C.A.A. Approved.

ENGINEERS (100% C.A.A. Approved) in office and on the ground. 100% C.A.A. Approved. 100% C.A.A. Approved.

FOR SALE

World's largest stock sale and used aircraft. 100% C.A.A. Approved. 100% C.A.A. Approved.

100% C.A.A. Approved. 100% C.A.A. Approved.

100% C.A.A. Approved. 100% C.A.A. Approved.

WANTED

100% C.A.A. Approved. 100% C.A.A. Approved.

1951 EXECUTIVE CHRYSLERS DONE

Trade of Buick, Lincoln, and other. 100% C.A.A. Approved. 100% C.A.A. Approved.

100% C.A.A. Approved. 100% C.A.A. Approved.

100% C.A.A. Approved. 100% C.A.A. Approved.

TURBOSUPERCHARGERS

DE Type R-21, R-23, R-31, C-31, New and serviceable.

AMERICAN TURBINE ENGINE CO. Box 2673 D. Pasadena 1, Calif.

FOR SALE

BEECHCRAFT C-18S

100% C.A.A. Approved. 100% C.A.A. Approved.

We Buy DC-3 and C-47

100% C.A.A. Approved. 100% C.A.A. Approved.

100% C.A.A. Approved. 100% C.A.A. Approved.

UNUSUAL OPPORTUNITIES

are to be found each week in the

SEARCHLIGHT SECTION

AVIATION WEEK, June 16, 1956

For Engineers . . .

Clear Horizons ahead

. . . at Goodyear Aircraft Corporation

BUILD YOUR CAREER and help build tomorrow's world with the pioneer and leader in higher-than-aircraft. There's a clear, bright future at Goodyear Aircraft for engineers with talent, initiative and ambition.

FORCEFUL, CREATIVE THINKING is the key to Goodyear's progressive research and development programs in missiles, electrical and electronic systems, sensor systems, new special devices and fiber resin laminates. Design and development engineering opportunities are many and varied . . . are now available to capable and imaginative men and women in the field of engines, aircraft and aircraft components.

POSITIONS ARE OPEN in several fields with salaries based on education, ability and experience.

Physicists	Civil engineers
Mechanical engineers	Welding engineers
Aeronautical engineers	Electrical engineers

Openings also exist for personnel with ability and experience in technical editing and writing, art, and motion pictures.

AKRON, HOME OF GOODYEAR AIRCRAFT, is located in the lake region of northeastern Ohio. Cosmopolitan living, year-round sports and recreation, cultural and educational advantages make this thriving city an ideal spot for a pleasant home.

THE TIME TO PLAN A CAREER IS - NOW! Write, giving your qualifications, or requesting an application form.

C. E. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION

AKRON 15, OHIO



DESIGN WEIGHT ENGINEER

A Real Opportunity Exists for an Experienced Top Caliber Weight Engineer to Originate Advanced Weight Evaluation and Estimation Methods for Development of Carrier-Based Fighter and Attack Aircraft

Preliminary Design Weight Experience Essential

Write for Interview Appointment to

ENGINEERING PERSONNEL
COLUMBUS DIVISION

North American Aviation, Inc.
COLUMBUS, OHIO

BOEING ENGINEERING OPPORTUNITIES

In the B-47 and B-52 PROGRAMS

For Engineers with 3 Years or More of Analytical Design Experience in

- Hydraulics
- Air Conditioning
- Heat Transfer
- Thermal Anti-Icing

Equally Attractive Openings for Engineers with Experience in

- Structural Dynamics
- Stress Analysis
- Aircraft Loads
- Flutter Analysis

Send Resume to: E. J. Sullivan, Asst. Dir., Boeing Aircraft Company, Wichita, Kansas

AIRCRAFT ACCIDENT INVESTIGATOR

To reach accident sites and investigate to determine cause of air frame failure. Position is a full time job. Requires a minimum of 4 years experience in aircraft accident investigation. Send resume to: Director of Accident Investigation, Federal Bureau of Investigation, Washington, D.C.

Aerodynamic ENGINEER

Required to establish and direct all aerodynamic study projects in connection with our primary design and analysis of aircraft. This aerodynamic engineer will be responsible for the design and development of aerodynamic configurations in such as airplane configurations, cruise, and takeoff configurations. He will also be responsible for the design and development of aerodynamic configurations in such as airplane configurations, cruise, and takeoff configurations. He will also be responsible for the design and development of aerodynamic configurations in such as airplane configurations, cruise, and takeoff configurations.

Send Resume to:

Professor J. A. Doolittle

Send Resume to
G. R. NORTROP

Aircraft Gas Turbine Division
**WESTINGHOUSE
ELECTRIC CORPORATION**
Local Branch P. O. Box 1000, St. Louis, Mo.

ENGINEERS

JOHN BANKS WITH
A PROUD AND FAMOUS
NAME—



LYCOMING member of



Yes, you work with a rapidly expanding engineering group. Work with top, consistently famous engineers, engaged in the design and development of gas turbines, reciprocating engines and related fields.

If you have a proven background of accomplishment in the above, it would be to your advantage to investigate the opportunities at LYCOMING.

We have immediate openings for:

- Assembly Engineers
- Location Engineers
- Project Engineers
- Senior Engineers
- Staff Engineers
- Draftsmen
- Design Draftsmen
- Layout Draftsmen
- Design Engineers
- Blueprint Checkers

Qualified applicants will be called for personal interview. Send complete resume to:

E. E. Stokess, Per. Supr.

Lycoming Division

Avco Mfg. Corp.

Stretford, Conn.

Flight at $M=1.3$... in the Laboratory



TRANSONIC, SUPERSONIC & HYPERSONIC . . .

... activities can be achieved in the various test cells and wind tunnels now nearing completion at the U. S. Air Force's Arnold Engineering Development Center. Several laboratories are already in operation, and the remainder are approaching their standard pattern of work. These unique testing laboratories will probe entirely new fields of flight research.

A number of extremely interesting positions for Engineers, Engineering Technicians and Technicians are now available at the Center which is operated for the Air Force by ARD, Inc.

Position openings are in these General Fields:

AERODYNAMICS--Structural, Theoretical, Thermodynamic
INSTRUMENTATION--Electronic, Pressure, Optical
DESIGN--Aeronautical, Mechanical, Electrical
OPERATIONS--Range and Turbogun Test and Performance,
Thermogun, Supersonic and Hypersonic Aerodynamic Tests
For further information, order
EMPLOYMENT MANAGER, Box 312, Tallahassee, Tennessee

ARD, INC.
TALLAHASSEE, TENNESSEE

Operating Contract for the Arnold Engineering Development Center

Cessna
**ENGINEERING
OPPORTUNITIES**
with world's leading producer of
light commercial airplanes

for

- Design Engineers
- Design Draftsmen
- Research Engineers

Send Resume to
Employment Manager
CESSNA AIRCRAFT CO.
WICHITA, KANSAS

ENGINEERS new aircraft projects at RYAN



IMMEDIATE OPENINGS FOR

Aerodynamics
Research Engineers
Engineering Designers
Systems Analysts
Electronic Eng. Techs
Drafting Engineers



Engineers in Administration
Engineers will be held
to strict confidence



RYAN
AERONAUTICAL COMPANY
SAN FRANCISCO, CALIF.

British Deliver the Goods!

Capital Airlines promises British-built turbo-propeller transports in regular service by next spring.

The American Airway is studying by its order, announced several ago, for British-built Comets.

A fleet of British-built de Havilland Doves is flying in this country as executive aircraft, and their numbers are increasing.

Such an infusion of British products would have been unobtainable to most U. S. commercial aviation people a short time ago.

One of the reasons for this unobtainable state of affairs was lack of a national aviation development program, as William Littlewood points out.

Another is that the very disappearance of military orders, whose arrivals of billions of dollars have put us so far ahead of the rest of the world in military aviation and research, have deprived non-military aviation of its share of attention, research and efficient aircraft.

We have no feeder system. We have no maintenance technician to the DC-3. We have not type in the 300-mph range, specifically designed for the executive aircraft market, and it is based on an earlier design. We have further to go in commercial cargo aircraft, both fast and medium speeds. We have no standard agricultural plane. Our lightplanes are improving but we are still some way from a design which is the best to revolutionize lightplane design if anyone wanted to do it badly enough.

By our own inaction, how many more projects will we leave to the British to deliver the goods?

Heinemann's Bantam Bomber

"Finally, someone had the courage to go out and do something about simplicity instead of merely talking about it," one of our engineering editors remarked as he studied the first photograph of the AHD Skyhawk.

In this case, the Navy's Bureau of Aeronautics, Douglas Aircraft Co., and its El Segundo Division chief engineer, Ed Heinemann, deserve the laurels for a bold break with recent tradition.

This remarkable-looking rugged attack plane, described elsewhere in this issue, reverses the discouraging onward march of ever more complexity, weight and cost of modern fighting aircraft that has brought increasing consternation to a few thoughtful men in aviation since the end of the war. No one has been more outspoken about the trend than Ed Heinemann, some of whose colorful outbursts were published on this page.

A glance at first photographs released by the Navy indicates that this bantam bomber, nicknamed Heinemann's Hot Rod, must have every engineering trick in the trade under its skin. It will need most of them to enable enough fuel to be stored aboard for a cross-country nonstop flight, which is reported to be one of its design requirements.

Regardless of how tests come out—and we learn from

every one of them—the Navy, Douglas, and Heinemann deserve our plaudits for daring to simplify the modern military airplane, and doing it in a big way. They may very well be opening a new era in design, production and utilization of high-performance, lightweight jet attack planes, bringing significant military and industrial changes, as well.

Voluntary Censorship

For the second time, AVIATION WEEK has evoked self-censorship involving a major development of a sensitive security nature. The latest has been its item on effect since Apr. 15, and will continue until further notice.

Aviation Week initiated a 60-day experiment in a similar limited, voluntary censorship late in 1951, involving the Boeing inter-continental B-52 bomber. This period was extended until the middle of 1952, when more official information about the big plane was released, and Life magazine appeared with other, unobscured information.

The earlier experiment was made in cooperation with Secretary Fawcett and the Air Force, after Mr. Fawcett made a special appeal to the press to help keep secret and information about the B-52 "sovereign potential enemy as long as possible." Aviation Week was then the only publication which adopted its own voluntary censorship policy, and for the period published only cleared or officially released data on the B-52.

In the current matter, we are withholding from publication any reference to what informed, unclassified research officials assure us is a discovery that appears to have important possibilities for improving performance of certain types of military aircraft.

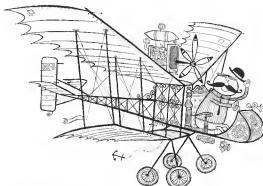
In fact, we are assured, the matter represents a major military and scientific secret. It is generally recognized that gradual, measured revelation, at least, of the development is only a matter of time, but these officials tell Aviation Week that every day that news of this discovery can be kept out of unclassified lands is important. They are not the kind of men to say "well" when no major security problem exists.

As our readers know, this magazine has fought all of its life against unnecessary news suppression and secrecy. It believes it is an enlightened public. It is a democratic way of life, a well-informed public must and should have access to many facts which would be denied the citizens of a dictatorship. There are times when it is more important to inform our own people than to deny them information on the grounds that such information also reaches unfriendly powers.

Unnecessary secrecy and improper controls, however, inevitably lead to abuse of power, waste and inefficiency.

Nevertheless, we concede that occasionally there is a matter of unusual importance which should not be publicized for brief periods, at least, in the national interest. The current subject, we believe, is one of those.

—Robert H. Wood



If it flies...

we make the gate valves for it!

FRANCIS YOUNG, THE STORY: In 1946, Whittaker designed and produced the first motor actuated gate type fluid shut-off valve for aircraft.

To date, Whittaker has delivered over 200,000 valves of this type... to provide on-off and restraining control of fuels, oils, hydraulic fluids, air, acids, and everything else that flows in aircraft!

Current production is at the rate of 8,000 monthly... because 100% of the military and commercial aircraft (and 75% of all other aircraft) use Whittaker gate valves.

Whittaker gate valves average up to 40% lighter than conventional valves, and don't require important when you remember that some planes carry as many as 30 shut-off valves!

The fluid pressure and flow requirements of aircraft vary and increase in each new aircraft you design... but don't worry! Remember... if it flies, Whittaker will make the special gate valves it needs! Just call the nearest Whittaker field engineering office.



W. H. WHITTAKER CO., LTD. • 418 N. CERRIL AVE. • LOS ANGELES 39, CALIF. • BRICKS WOOD • 4-0444
 Birmingham, Long Island, Montreal 2-1224, 2-1226, Indianapolis, Newark 641, Baltimore, Newark 2-1225, 4-1226, Wichita, KS 6165, 62-4275, Seattle 1-1224 1222

CONQUERING the Time Barrier



*Top-caliber engineers
will find exceptional
opportunities at Maxson.
For details, contact G. R. Pratt.*

COMPUTERS translate split-second decisions into instant action beyond any human ability . . . in bombing, in fire-control, in navigation. Maxson has been developing and building these computers for nearly twenty years.

MAXSON develops and manufactures systems, subsystems, and components in armament, navigation, electronics, and special devices.

Ask for facilities report.



THE W. L. **MAXSON** CORP.

460 WEST 34th STREET, NEW YORK 1, N. Y.

Please, in Oglethorpe, Penn., and Long Island City and New York, N.Y.